THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVIII. No. 2003.] LONDON, OCTOBER 1, 1901. [53RD YEAR. PRICE 6d.

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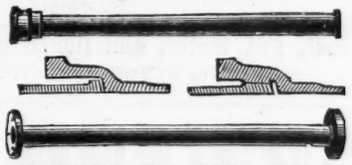

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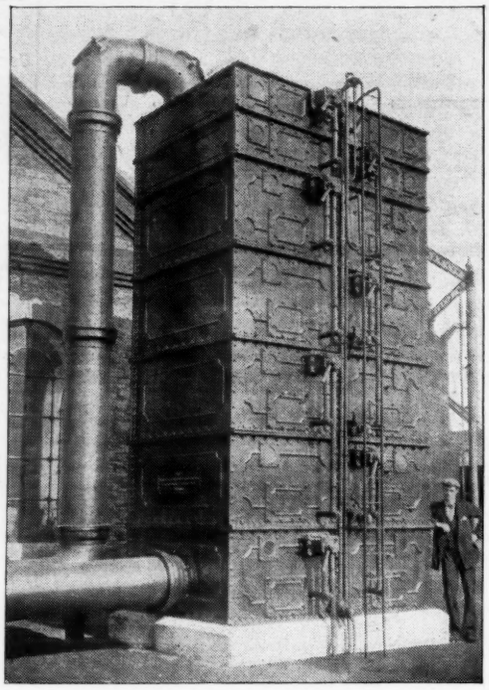

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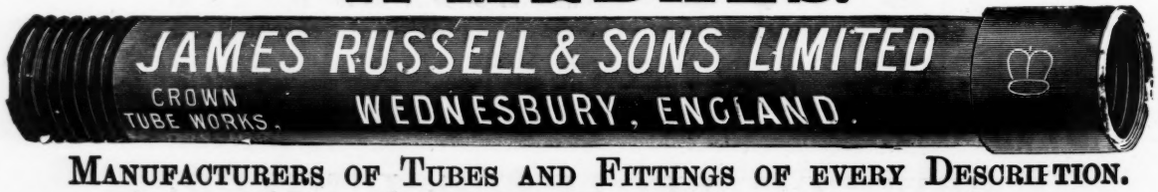

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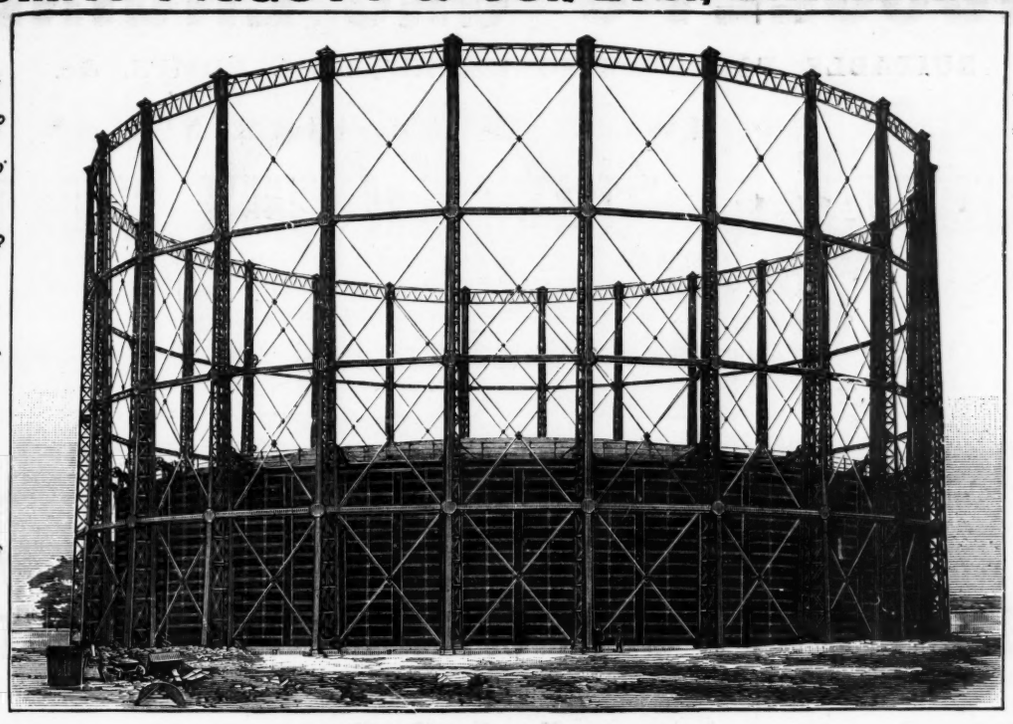

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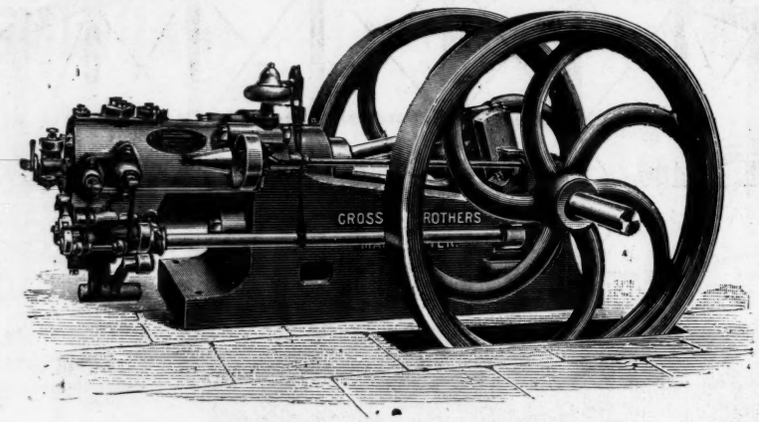

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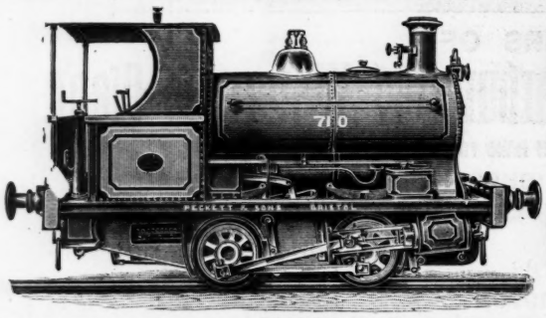

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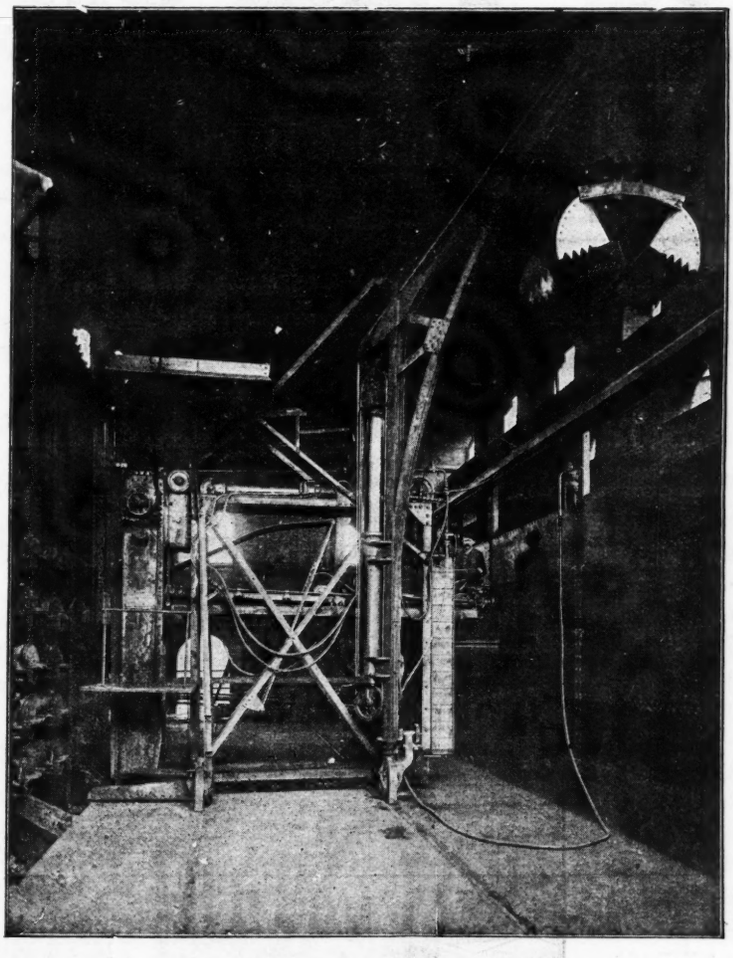

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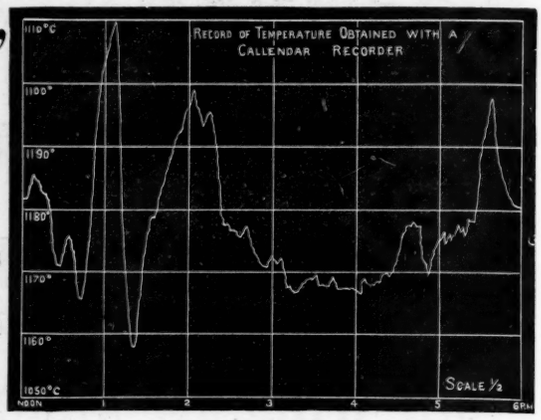

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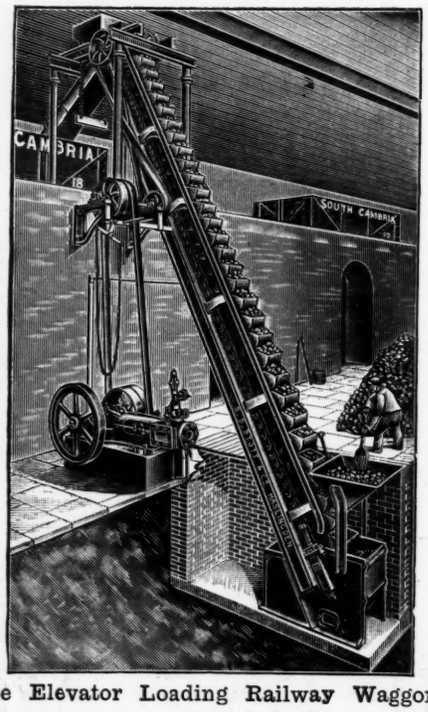

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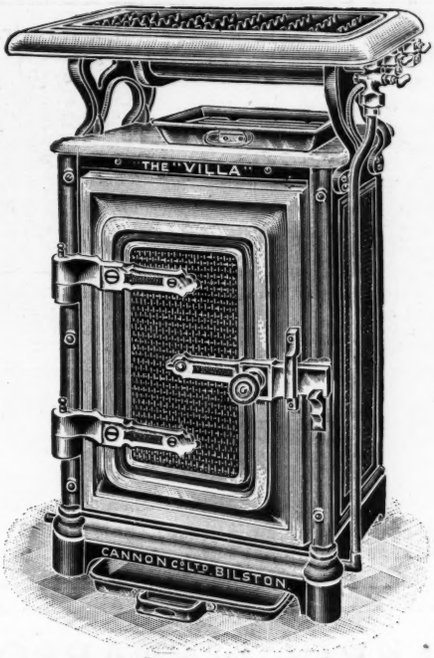

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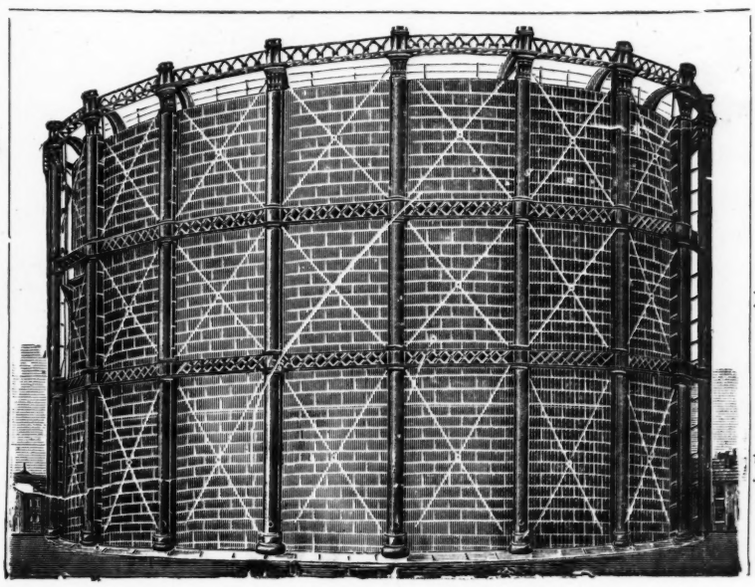

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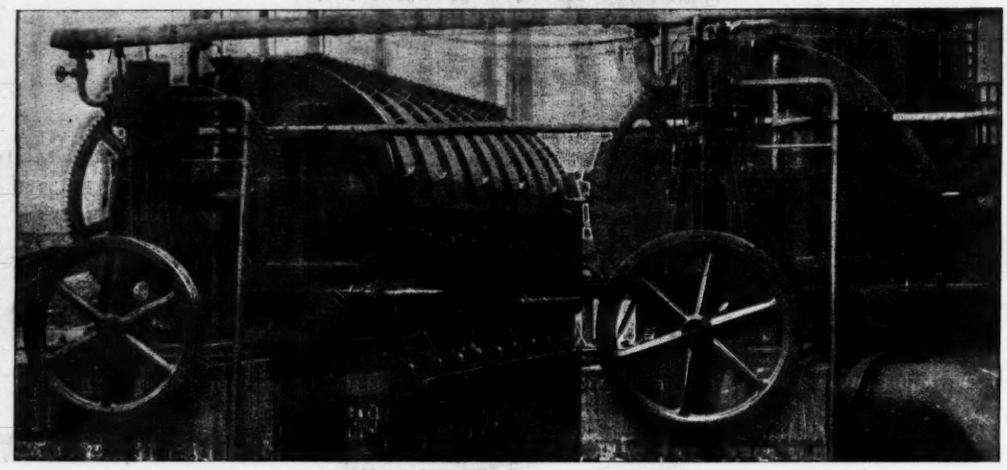

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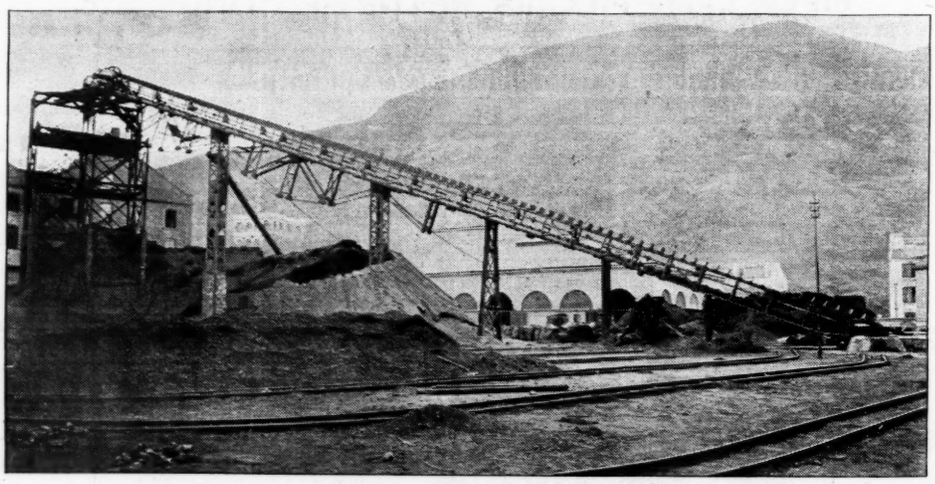

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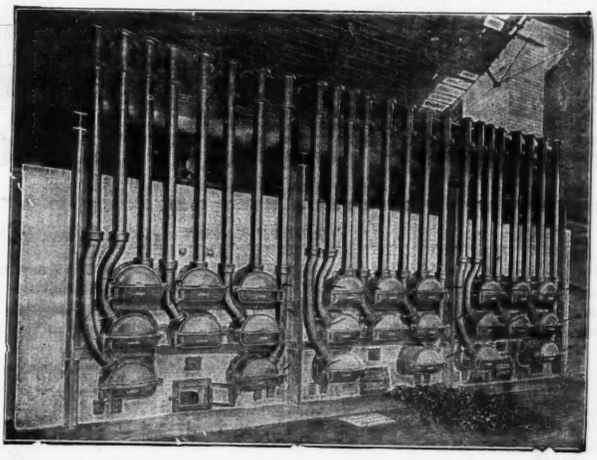

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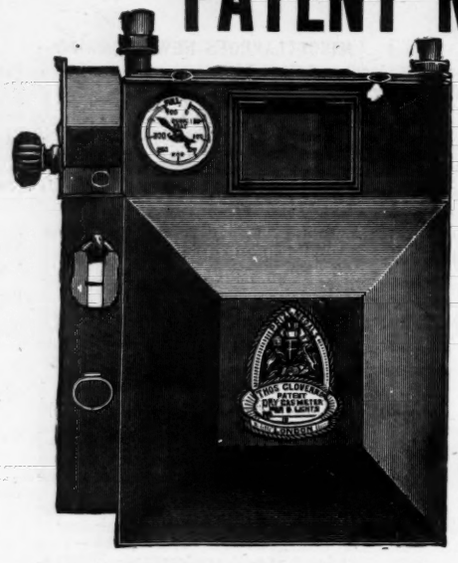

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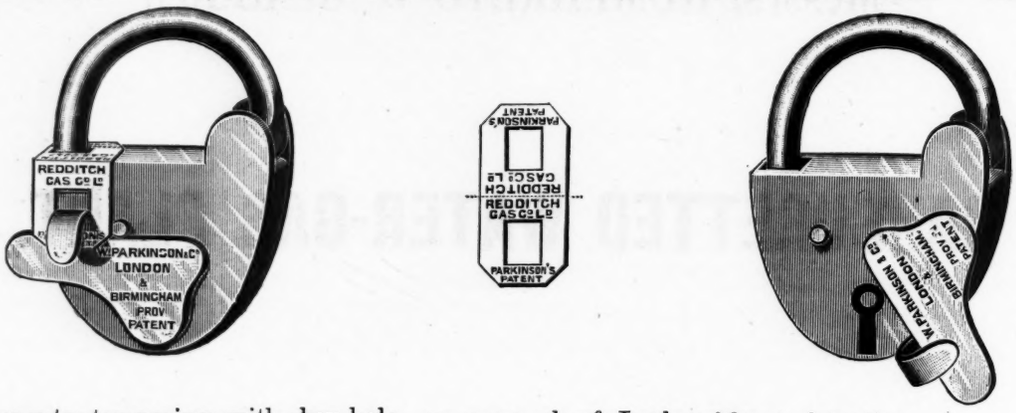

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EDITORIAL NOTES.

A New Edition of "Michael and Will."

THE publication of a new edition of "Michael and Will" is an event of sufficient importance for all holders of responsible positions in British gas-works, to be signalized among the notable occurrences of the week. We shall review the new book in due course; but for the moment it must suffice to acknowledge its indispensable quality. During the interval that has elapsed since the previous edition appeared, great changes have supervened upon the law of gas supply in particular, and also, it may be remarked, in the fashion of lawbook authorship. Just as the wording of Acts of Parliament has grown more familiar and colloquial, so in the same, or an even greater, degree has the ancient arid formality disappeared from legal treatises. Mr. A. Birrell and others have proved that it is possible to teach exact law in a plain, even amusing way; and consequently many of the antique cobwebs that hung over law-books have been cleared off. It will not be surprising therefore to learn that Mr. J. Shiress Will has found it expedient to largely revise, and in many parts completely re-write, his work. This is especially true of the well-known "Introduction," which in previous editions has taught so many gas managers all they know of gas law. One thing it is only necessary to say about modern law and law books. The simplification and shortening of statutes has been attended, as everyone knows, by an increase of the vexatious proceeding commonly described as "legislation by reference." It is so easy for the parliamentary draftsman to stipulate that the scope of his measure shall be held to include so-and-so, "as defined" by some older Act, with the terms of which he is perfectly familiar, that these experts have overlooked the possibility of this kind of statutory shorthand proving a source of annoyance to others less conversant with the Acts referred to—including His Majesty's Judges. It has come to be impossible, on this account, to interpret one Act of Parliament without consulting several others, which again may have been explained in leading cases known only to the learned. Hence the law-book is more of a necessary than ever, as Acts of Parliament multiply and cases increase. It comes with a shock of a surprise to read that the previous edition of Michael and Will is dated 1894. Much has happened since then; and still the law of gas supply is in a transition stage, through which the guidance of a sound lawyer is cheap at the price of a book.

Education and Enthusiasm.

IN another column of this issue, will be found an article dealing with a Consular Report upon Chemical Instruction in Germany. This report serves to emphasize two points that we were at pains to make last week. One is the necessity of providing a well-laid foundation of general primary education before any attempt is made to build up a complete structure of higher technological instruction; the other is the incalculable value of enthusiasm. As to the first, the necessity of giving a young man a thorough general education before attempting to specialize him, is more widely recognized in Germany than with us. Of the 5000 and more students at the Prussian technical high schools—which provide a splendidly complete training in the highest branches of theoretical and practical science—nearly 50 per cent. have passed through the full gymnasium or real gymnasium course of nine years' thorough general education. Such a preliminary training is of the greatest value. It increases a man's general usefulness in life; it develops his intelligence in every, rather than in merely one, direction; and it prepares his mind to receive and to profit by the specialized instruction that is to follow. The chemist or the engineer may never, in after-life, require to make direct practical use of the knowledge of euclid acquired at school or college; but who can estimate the value to him of the exercise given by its study to his logical faculty?

Ruskin more than once pointed out this need of a wide basis of primary education. We should not, he says, call a man healthy who had strong arms, but was paralytic in his feet; nor one who could walk well, but had no use of his hands; nor one who could see well, if he could not hear. We would not voluntarily allow the bodies of our children to be so partially developed. Much more, then, we should not, if we can help it, allow their minds to be so limited in their growth. And as our bodies, to be in health, must be generally exercised, so must our minds, to be used to the best advantage in any one special direction, be generally cultivated. We should, in this country, obtain much better results for the money we spend upon technical education if we insisted that the partially developed or the altogether undeveloped were not to be allowed admission to our technical classes. What precautions are taken to see that the students in gas manufacture at the various polytechnics have had the preliminary training that can alone enable them to profit by the instruction of the teachers of technology? Speaking not without knowledge, we should say that many, if not the majority, of those students are, from mere lack of general intellectual development, absolutely certain never to put that instruction to practical use. They therefore waste time and money that might be spent profitably upon those students who bring to their study of technology minds previously cultivated and trained in the acquisition, and digestion of knowledge. Better only five experts, than a hundred smatterers!

In addition to that preliminary fitting of the mind to learn, those who would succeed in their enterprise in life must bring to the study of its technics something more. That something is enthusiasm—the salient virtue of all our greatest men. As the greater contains the less, enthusiasm implies industry; for it is a spurious enthusiasm that does not drive a man to work. It has been truly said that an investigation of the lives of great men demonstrates nothing more clearly than that they were all great workers. Nothing is more astonishing than the quantity they have accomplished in the course of their lives; and there is not one but has been fired by enthusiasm for some cause or another. In the world of chemical research and practice, the German, in this respect, sets the Englishman a worthy example. Dr. Rose, the British Consul at Stuttgart, pays emphatic tribute in his report to the earnestness, zeal, and diligence of both teacher and taught in the Universities and technical high schools of Germany, of which he has had personal experience for many years; and, as he says, it is fairly beyond reasonable doubt that to these characteristics in professor and student, and to the signal capacity for independent research thereby created in the latter, the great advance of German chemical science and industry is mainly due. The whole of his report is well worth the study of those who have at heart the future welfare of those industries in this country which depend, in greater or less degree, for their advancement upon the discoveries and triumphs of the science of chemistry.

Mr. W. R. Herring and Inclined Retorts.

FOR reasons which need not here be stated, inasmuch as they will suggest themselves to all gas engineering readers of these lines, the paper of Mr. W. R. Herring, the Engineer to the Edinburgh Gas Commissioners, on "Inclined Retorts," which we published last week, will be esteemed as of first-rate technical importance. Mr. Herring is, unquestionably, one of the sources of motive power in contemporary gas engineering practice. He works in broad daylight, showing and telling everybody what he is doing, and why; and having once courted publicity with a paper on a disputed point of practice, such as the advantages of inclined retorts, he does not weary of following up the subject. This is the way to make progress sure. An engineer who thus stakes his professional reputation at every fresh deal, so to speak, conquers one's respect for his pluck. For if he should ever make a mistake—as, being human, is more than likely to happen at some time or another—all the world must know of it. But in such an eventuality, nobody would dare to use the knowledge to the disadvantage of the man who never hid himself in the mysterious reserve affected by certain professionals

who are so afraid of making mistakes that, as the proverbial saying goes, they never make anything else.

A year ago, Mr. Herring gave to the North British Association the benefit of his views on the angle of repose of coal and coke as affecting the determination of the angle of inclination of the floor of a sloping retort. He then declared for making this angle such as might be depended upon to hold the charge of coal in an even layer throughout the period of carbonization, relegating the automatic emptying of the coke by the force of gravity alone to a secondary place in his consideration. The election between these two different and not always reconcileable objects of inclining retorts had to be made; and that Mr. Herring chose the right one, having regard to the main purpose for which gas-retorts are used, no engineer will deny. It is open to an engineer to say that, what with the apparently irreconcileable requirements of good charging and easy discharging, and the incidental conditions of efficient working of inclined retorts mentioned by Mr. Herring last year, he would rather not be troubled with so questionable a system, especially in view of the possibilities of horizontal retorts worked mechanically. But, granting Mr. Herring's premises, he must be allowed to have adhered to essentials in working out the details of his inclined settings.

This year Mr. Herring took advantage of the international character of the Gas Engineering Conference to challenge Continental engineers to show cause for their fashion of short retorts; contending that British practice has amply proved the possibility of working with 20-feet retorts. Only one Continental speaker took up the challenge at the time—Dr. Leybold, of Hamburg—and he merely gave "a woman's "reason" for the German fashion. It is so; and it pleases them. This, of course, was no answer at all to Mr. Herring's point that long retorts are better. Unless further evidence is forthcoming on the other side, it will be generally considered that the superiority of the British practice is established. The ruling necessity is to get as much gas as possible from the available ground space; and here the long retort must beat the short, other things being equal.

The other points put by Mr. Herring did not fare quite so well. He "plumped" for continuous hoppers for charging; gave up automatic discharging; advocated the provision of a power ram so as to start the coke; and has adopted gas producers to every setting. These decisions were adversely criticized by Mr. S. Y. Shoubridge on technical grounds; and the whole system was subjected to some severe financial strictures by Mr. A. F. Wilson. Mr. Wilson declared that the interest and other capital charges on such a plant would set-off the saving of wages. Mr. Shoubridge condemned the idea of adding power discharging machinery to the inclined retort benches, as giving away the principle; and he roundly declared that, with a better method of charging, nothing of the kind would be needed. Mr. Shoubridge also explained that his objection to continuous coal hoppers rests upon their extreme costliness—thus supplying the reason for separate coal-bins, which Mr. Herring had professed his inability to find. The same critic also pronounced in favour of large outside producers for heating the benches, in preference to the individual bench producers used by the author.

We publish to-day, by request of Mr. Herring, a tabular statement of the cost of carbonizing at Brentford and Huddersfield before and after the change to inclined retorts. The picture might be strengthened by mentioning the fact that, in the interval, wages have risen considerably, while the output of hand stoking has not correspondingly increased. However, the advantages of inclined retorts, it will on all hands be admitted, must stand comparison, not with what existed at one time, but with anything and with everything with which the system might be brought into competition to-day. For example, Mr. Foulis was present when Mr. Herring read his paper; but he kept silence as to the terms upon which he would be able to solve the problem of carbonizing 1000 tons of coal per day. It would not be by the principle of inclined retorts. It would be interesting, also, to hear what Mr. Tysoe could say on the subject, from his East Greenwich experience. Nothing is more common, or more natural, than for the man who makes a particular improvement upon a defective or an obsolete industrial process, to base his comparison of advantage on the difference between the old and the new. To a certain extent he is justified in so doing, for his own credit's sake; but he cannot prove in this way that he has chosen the best means of improvement open to him. That is a different question, which, in the case in point, was not so much as broached. Let us hasten to add that, in the circumstances, it would have been a delicate operation for Mr. Herring to perform; and he is not to be blamed for keeping off debatable ground. Others, however, are free to continue the inquiry from the point where he left it. In parenthesis, we should like to know how Mr. Herring has fared with the settings of twelves of which he spoke last year.

Report and Accounts of the Commercial Gas Company.

THE report of the Directors and the statement of accounts relating to the working of the Commercial Gas Company for the last half year will be found in another column; the ordinary general meeting being called for Thursday. The report states that the net profit for the half year to June was £44,651; and that the Directors recommend the payment of dividends after the rates of 12 and 9 per cent. per annum upon the old and new stocks of the Company respectively. The price of gas has been reduced from 3s. to 2s. 8d. per 1000 cubic feet as from the Midsummer index-taking. The accounts do not offer much fresh food for comment. The cost of manufacturing gas has risen, of course; the amount being £128,756, as compared with £104,279 for the corresponding half of last year. The gas sales brought in £197,239, as compared with £175,566, which shows that the advanced price of gas last year was neither too much nor put on too soon. The quantity of gas sold for public lighting shows a small decrease, owing to the indulgence of the Poplar Borough Council in electric lighting. But the private consumption has increased in a still greater proportion; so that the total quantity of gas accounted for is larger by nearly 27 million cubic feet. According to the usual practice of this Company, all the remarkable experiences of the Administration for the half year are reserved for the Chairman's speech, which should be particularly interesting this time by reason of the profit-sharing experiment of the Board.

Lord Rosebery on British Municipalism.

THE Earl of Rosebery was last week speaking at Stranraer (whither he had gone to receive the freedom of the burgh), on various topics more or less germane to the matter in hand. The noble Earl is no stranger to municipal life, having had the instructive experience of presiding over the deliberations of the London County Council. He is, indeed, a sort of "Perpetual Grand" of this ambitious body, which pays more heed to his unofficial counsels than to words of truth and soberness emanating from anybody else. Although it cannot have been easy even for Lord Rosebery to find something fresh to say on such an occasion as that of his becoming a burgess of Stranraer, yet he contrived to evoke some inspiration from the circumstance of the Provost being a nobleman—Lord Dalrymple. This fact served as the peg upon which Lord Rosebery could hang some wise remarks as to the desirability of municipal honours being sought by men otherwise distinguished. Only in this way can British municipal life be kept pure. Members of the aristocracy, whether it be of birth or personal merit, ought to come forward to take their share in the work of local government, which otherwise will fall to those who will not elevate and may possibly disgrace it. Not by legislation alone, as Lord Rosebery truly remarked, has the standard of municipal life in Scotland and in England been raised. The best written constitution that was ever framed will fail of its object if it is corruptly administered; and it would be idle to pretend that British municipal government, alone of its kind in the world, is immune to the contagion of corrupt administration. It may be seen in the United States how a corrupt force can, by slow and insidious degrees, gain so firm an establishment in municipalities that it is practically impossible to drive it out. Lord Rosebery mentioned this subject because the danger is one to which the country is always liable "on account of the increasing magnitude of "the funds with which municipalities have to deal." He at least does not regard the large local national debt of this country as a matter of but small importance. It may have been, and probably has been, money well spent upon the whole; but at the same time it must be remembered that "where a debt of that kind can be incurred, there must be "facilities of illicit expenditure, not merely of illicit expendi-"ture but of corrupt opportunity, and where those facilities "or liabilities occur, we have to keep a vigilant watch lest "corruption itself creep in." Speaking of the greater requirements of town populations at the present day, as compared with the olden times when rates were low or non-existent, Lord Rosebery mentioned better lighting as one of

them. "Streets lit as they were forty or fifty years ago "would be considered cut-throat lanes by the population of "to-day." The proper provision of all these modern necessaries of town life calls for the selection of the best men that are available for the public service in any community. In the measure in which the right men come forward to do it, will it be possible and safe to enlarge the responsibilities and increase the work of municipalities. The trouble at present with many of our British municipalities is not that they are corrupt, but that they do not deal fairly by private enterprise, or even by their public. The only remedy for this is to leaven these bodies with a sufficiency of men having a large experience of affairs, and accustomed to deal with money in large amounts.

The Labour Topics of the Week.

THE news of the week concerning Labour topics is of rather more than common interest. The American steel workers' strike, which was to do such wonders and was reported to the British Trade Union Congress as certain of success, collapsed amid the contemptuous expressions of the newspapers which had shortly before favoured its organizers with the publicity usually reserved for crowned heads and first-class criminals. These "organs of opinion" now characterize the strike as ill-advised, as badly-managed, and so on; but they did not say so at the outset, when some such strong expressions might have discouraged the wirepullers. Newspapers in general are greatly to blame for their thoughtless and mischievous co-operation with the professional fomenters of industrial strife. Editors do not seem to have any settled rules for dealing with the mass of cheap "copy" which an impending strike always brings to newspaper offices. Small reporters are allowed space wherein to record the opinions of a Mr. Schaffer, or a Mr. "Pat" Reilly on the "situation;" and, of course, this obsequiousness to a set of meddling nobodies makes them more bumptious than normal, which is needless. It is usually not until matters have grown serious, with scores or hundreds of ignorant, deluded men out in the streets for a cause which is clearly foredoomed to fail, that somebody who knows a little law and history takes notice of the trouble, and sees that the truth shall be told.

In America, the usual Dutchman and Irishman in the capacity of Trade Union leader, undertook once more to terrorize the Anglo-Saxon employer, with the usual result. There is something in this familiar combination which answers specially well to the ordinary requirements of Trade Union leadership, up to a point. The German element contributes the Socialistic politics, generally anti-English; and the Irish carries it for fighting. The mischief is that neither element separately, and certainly not in combination, ever realizes the supremacy of law, or the character of the race to which the employers in English-speaking countries chiefly belong, until these have been manifested in the most unmistakeable fashion. Over and over again the same world-drama has been played, always with the same finish. The Englishman in authority cannot be beaten, cannot give in, cannot submit to arbitration when confronted with a revolt of the nature of the one now in question, because he is on the side of the eternal laws, which, as Sophocles pointed out, override all mere human inventions. Newspaper editors might more generally recognize the fact, and deny their columns for the advertisement of the Jack Cades of an hour who call themselves Labour politicians.

The Cork Gas-Works strike was another of these revolts against the rules by which the world wags; and it has at length gone the way of all its lawless precursors. Here again, the task of those who had to bear the burden of defending the right was unnecessarily aggravated by the mistakes of amiable but ignorant persons who were carried away by the revolters' proposed willingness to submit their cause to "arbitration." When will such people understand that in the case of others, as in their own, there are interests which cannot be submitted to arbitration, and as to which conciliation is an empty word? If another man asserts an equal right with myself to my property, including my wife—this is the bare Anarchist position—I do not argue with him; I send for a policeman. In the temporary absence of the appointed guardian of law and order, I deal with the outlaw in my own way. This is sound law and common-sense; but, oddly enough, some good people cannot see the analogy in the case (say) of a gas-works manager entrusted with the care of other people's property. Of course, the disaffected and the disloyal profess their willingness to abide by the award of an arbitration; and this pretence to magnanimity gains over the unthinking. The question of who is to be master does not admit of compromise. The Cork gas-workers know who is master now; and the lesson ought to do them and others good.

The Bethesda case belongs to the same category. Not even the official apologists for Trade Unionism who constitute the Labour Department of the Board of Trade, can explain the outbreak at Lord Penrhyn's quarries on any other ground than that of a usurpation by the workmen of the right to control the conduct of the undertaking. Thanks to the usual political and other complications which always supervene upon a big dispute of this kind, the settlement has been long delayed; but it has come in sight at last. The malcontents find that individually they need the employer rather more than he needs them; and accordingly they are coming back—to the disgust of the outside agitators who have befooled them throughout. The only other outstanding labour dispute of importance—the great strike of the Grimsby steam trawlmen—will probably be ended in the same way by the time these lines are due to see the light. The employers have formulated their terms, which even the strikers consider as fair; but at the moment of writing the ghost of the old deceiver—arbitration—appears to stand between the parties. Immediately this spectre is laid, the trouble will be over. Lastly, the Taff Vale Railway case has borne its first fruit in the shape of an injunction granted in the Lancashire Chancery Court against a Trade Union for picketing "except merely to obtain or communicate in-"formation." Also, the Labour Candidate for North-East Lanark was left at the bottom of the poll at last Thursday's bye-election of a member of Parliament for this working-class constituency. This does not augur well for the speedy success of the Social Democratic and Trade Union prescription of a hundred Labour Members to be returned to the House of Commons, in order to procure an alteration of the law of Trade Unions as lately defined by the House of Lords. It may here be useful to state that a succinct compendium of this law has just been issued, in the form of a pamphlet, by the Employers' Parliamentary Council.

How thin is the division between what is lawful and what is not, may be perceived by comparing two reported incidents of the week. In London, a gang of bricklayers refused with one consent to go on working if an ex-member of the Union, who had not a clean card, was retained on the job. Result of an application to the Magistrate—"no case" against the men, because there is no law in England to compel a man to work with another man against his will. On the other hand, three Sunderland waggoners struck work because a fourth did his journeys in less time than they thought fair, and "induced the labourers in the timber works to come out "with them." Later, a new driver engaged by the firm was set upon and grievously ill-treated. Result—Mr. Pete Curran, the General Organizer of the Gas Workers and General Labourers' Union, to which the strikers apparently belonged, disowned complicity on the part of the Society with these doings. "The local Secretary and he had advised "the men to go back to work. . . . The organization "would be absolutely irresponsible. The men would receive "no dispute pay, and would not be recognized by the "Society." There was clearly undue influence here, if not conspiracy; and Mr. Pete Curran has heard of the Taff Vale Railway judgment.

The Need of Using Young Men.

NOTICE has, on more than one occasion, been drawn in the "JOURNAL" to the scarcity of "coming men" in the gas world. Those leaders of the profession who are advancing in years have been looking around them for their successors, only to find that the number of obviously qualified men is lamentably limited; and they have been asking each other what the meaning of it all is, and what is to be done. It is, therefore, distinctly interesting to find one of the leading weekly newspapers seriously discussing the dearth of rising statesmen of a calibre equal to the generation that is passing away. One feels disposed to ask whether there be cycles in men, as in trade—periods of brilliance followed by periods of dulness. The writer in the "Spectator" reviews the nations of Europe, and finds everywhere an era of mediocrity, with no oncoming men as yet in sight. In our own country, it is almost a commonplace that, looking for any man of striking ability among our ministers—or, for the matter of that, among their opponents—is a disappointing occupation. Men who know what to do, and who do it, are to seek; the lack

of business capacity in our administrators is as patent as it is regrettable. What is to be done?

Curiously enough, the parallel between our views upon the situation in the domain of gas affairs, and that of the writer in the "Spectator" upon the situation in the larger world of State affairs, extends to the remedy. We have urged before, and we repeat, that those who are to succeed the veteran leaders of the gas industry are to be looked for rather in the junior than in the senior ranks of the profession. That opinion is not a popular one—in the senior ranks. But there is much to be said in its support; and we now find it put forward by the "Spectator" as a possible solution of the larger problem. The writer in our contemporary declares that he sees "no remedy, unless the rulers "will rid themselves of the prejudice in favour of the old, "and 'experiment in men' by entrusting high office to the "young, who, as Lord Beaconsfield long since pointed out, "have done most of the great things done by individuals "throughout the history of the world. If everybody is to "begin in middle age, and a man of forty is to be considered "a boyish politician, we cannot expect—even under the new "conditions of health which leave men of seventy able to "ride bicycles—to train up statesmen." We believe this is exactly true, *mutatis mutandis*, of the gas profession.

It becomes, every day, more and more apparent that, for the gas industry to maintain and to improve its position, enterprise, new ideas, and ready initiative are qualifications which it is imperatively necessary that the leaders of the industry should possess. Speaking generally, and with a due reservation of the exceptions which must be made to such a general statement, it is nothing but foolish to look for those qualifications in the men who have been soaked in the traditions, the routine, the accepted practice of the industry for thirty or forty years, and who have not as yet had put upon them the stimulating responsibility of controlling the destiny of the enterprise in which they are engaged. The permanent staff, whether of a government department or of a trading concern, believes in routine, and has a deep-rooted pessimism as to the utility of experiment. Reforms, for the permanent official, mean extra work and no extra credit. It is the statesman, or manager, who gets the latter; hence it is not to be expected that the man who has for the best part of his life been a follower, and has been more or less consciously opposed to innovation, can, simply by the bestowal of the title of manager, become at once, or ever, an innovator and an enterprising leader. To follow, says the "Spectator," "is a function most easily assumed by the "middle-aged and the mediocre; the young believing more "in their own plans." As Bacon puts it, imaginations "stream into their minds better; the invention of young "men is more lively than that of old. . . . Men of age "object too much, consult too long, adventure too little, "repent too soon, and seldom drive business home to the "full period, but content themselves with a mediocrity of "success." Therefore, we say, let the gas industry look to its young men, and see that it makes full use of them.

New England Water-Works Association.—The twentieth annual convention of this Association was held at Portland, Me., from the 18th to the 20th ult. The following papers were considered: "The Bacteriological Analysis of Water and its Interpretation," "The Work of Sanitary Inspection on the Metropolitan Water-Works," "Water Supplies of the State of Vermont," "Swamp Drainage for Watershed Improvement," "What an Engineer Saw in Venice," "Pollution of Streams by Manufactural Wastes—Methods of Prevention," and "Investigations in Regard to Colouring Matter in Waters and Methods of Removal." Reports were also made from the Committees on uniform statistics, standard specifications for cast iron, and the apportionment of charges for private fire protection.

Gas-Motor Cars and Lamp-Posts.—We have before heard of the Dunkley gas-motor car; and we hear of it again through the "Daily Mail," according to which it forms one of the most attractive exhibits at the Birmingham Polytechnic Exhibition. Our contemporary states that it is fitted with twin-cylinder gas-engines and small compressing-pump. In driving the motor 30 cubic feet of coal gas are consumed per hour. The car can draw its own gas from any ordinary gas service, and store it in the cylinders underneath; an ordinary street-lamp being fixed on the stand in the present instance with a prepayment meter connected with a rubber tube coupled up to the back of the car. On the back of the front seat, and facing the driver, is a pressure-gauge, which indicates the number of feet of gas, and a regulator also is attached, which enables the motor to be fed at the normal gas pressure. The feature of the car is, of course, that it can be served with gas at any point of its journey by arrangement with the gas suppliers.

ESSAYS AND REVIEWS.

CHEMICAL INSTRUCTION AND THE CHEMICAL INDUSTRIES IN GERMANY.

The Foreign Office publishes every year a number of Diplomatic and Consular reports, the majority of which are of small utility and less interest. Occasionally, however, a report of exceptional value is issued; and we have one such now before us. It is a report by Dr. Frederick Rose, His Majesty's Consul at Stuttgart, on chemical instruction in Germany, and the growth and present condition of the German chemical industries. It is intended to show to what extent those industries have benefited by the large sums expended by the German States on the education of chemists. It is, of course, impossible absolutely to prove to what extent the wonderful expansion of chemical enterprise witnessed in Germany in the past thirty years has been brought about by the increased and improved educational facilities—much of that expansion being due to the natural course of events; but it can at least be shown, and Dr. Rose in this report shows, that the rise and expansion of new branches of chemical industry have followed and attended the institution and amplification of centres of chemical instruction.

Chemistry was taught in Germany as far back as the beginning of the 17th century, at the Universities of Jena and Marburg. But to the University of Göttingen is due the honour of having introduced the first regular lectures on technical chemistry and technology; and it was there that the first German manual of technology was written. The study of both theoretical and practical chemistry was soon taken up by the other universities. The first public laboratories for the general use of students were opened at Göttingen in 1809 by Professor Strohmeyer, and at Giessen, in 1827, by Dr. Justus von Liebig. At the latter, no less than fifty students were studying in the winter of 1841; every student being expected to "devote himself from the morning until the evening to analytical investigations of every description," and an examination was held every week to test the progress made.

This example of thoroughness and application in the study of chemistry laid the foundation of the wide-spread system of chemical instruction existing at the present day, and gave the first perceptible impulse to the development of the chemical industries of Germany. But the methods adopted by the technical high schools left, at the beginning, much to be desired, as the erroneous opinion prevailed that it was not necessary for the students to devote themselves to the study of scientific works, but rather to acquire a certain practical aptitude in superficial manipulation and the judgment of results. Later on, however, it was clearly perceived that a scientific foundation, laid during the scientific courses at the technical high schools formed the soundest basis for the practical experience to be gained during professional life. So far as chemistry is concerned in this respect, the efforts of Karmarsch, Krapp, and Wagner have been of the greatest value in effecting the necessary reforms.

The tendency in Germany is for chemical instruction, in its highest phases, to be provided rather in the technical high schools than in the universities; the former being mostly situated in the capitals of, and receiving assistance from, the various States. As an instance of this tendency, Dr. Rose mentions that the chair for chemical technology, together with the chemical technical collections, have been transferred from the State University of Giessen, in Hesse, to the Technical High School at Darmstadt. Full details are given of the hours devoted to the various branches of chemical science at some of the principal schools, making in all a very full meal for any student attending all the lectures. As to the cost of such a course of instruction, Dr. Rose mentions £15 per annum as being a fair average year's expenditure in fees for the study of chemistry—theoretical and practical—in all its ramifications. For this comparatively small sum, the finest instruction, and the best equipped laboratories, are open to the student. "If his annual expenditure for living is further estimated at £75 . . . . his total annual expenditure would amount to £90. . . . For those students—and there are many, especially in large towns with universities or technical high schools—who board and lodge with parents, relations, or guardians, the above expenditure can be greatly reduced."

The number of students of chemistry at the five principal technical high schools increased from 326 in 1884 to 868 in 1898; while a considerable, but by no means so great an, increase has taken place in the number at the universities. As to the preliminary education of the students at the high schools—a very important matter, since, as we have said before, it is no use, indeed worse than useless, trying to build upon a poor foundation—Dr. Rose says: "Of the 5115 students at the Prussian technical high schools in 1899, no less than 1406 had passed through the full gymnasium course, and 1065 through the real gymnasium course. The figures for 1884 were 172 and 316 respectively, which, allowing for the total increase of students for the period 1884-99, shows that in 1899 about double the number of students had attained the highest preliminary school education than in 1884. To those who are conversant with the thorough and rigorous nature of the nine years' course at these schools (classics, modern languages, mathematics, elementary science),

these facts form a striking proof as to the high standard of the preliminary education acquired by intending students at technical high schools. . . . They show what value is attached in Germany to a thorough course of school education before the study of professions is commenced at the universities or technical high schools."

Considerable numbers of the students at the German schools (about 13 per cent.) are foreigners—chiefly Russians and Austrians, the number of British students being very small. As to this point, Dr. Rose remarks:

Although the facilities for chemical instruction in the United Kingdom have been greatly improved, and are still being increased, it is certainly to be keenly regretted that so few English students avail themselves of the opportunity of studying chemistry in Germany, and thus gaining an insight into this magnificent system of technical instruction. It is difficult to understand why this should be the case. The cost of living is moderate, the distance is only from 24 to 30 hours, and the language is by no means an insuperable obstacle, as a knowledge of the same, sufficient for chemical purposes, can be acquired with moderate assiduity and ability in six to eight months; and, moreover, most German professors of chemistry understand or speak English well. As a matter of fact, a knowledge of the German language is indispensable by every chemist—whether he has studied in Germany or not—who desires to master the principles and perpetual progress of his profession, as the best chemical manuals are German, and about two-thirds of the world's output of chemical research work comes from Germany. Certificates from good schools in the United Kingdom, proving the attainment of a sufficient standard of preliminary educational ability, are generally accepted without demur; and the academic authorities and professors show the most unvarying courtesy, and the most painstaking care, towards English students.

The improved and extended facilities for chemical instruction provided at German universities and high schools have naturally resulted in a great increase in the number of educated chemists. During the past 25 years, the number of chemical works in Germany has doubled itself; while the number of trained chemists employed in these works has risen from 1700 to 4500. There are, in addition, some 1000 technical chemists trained in Germany and now employed at works and laboratories in foreign countries; about 650 employed as professors, lecturers, or assistants at the various universities and schools; 400 private chemists; 300 apothecaries with full chemical qualifications; and about 500 classified as "various chemists." A goodly result; but we are told that chemical industrial circles in Germany are by no means satisfied with the great progress and measure of success already attained, and are actively endeavouring not only to maintain, but to increase, the present facilities for technical education. That these efforts are proving successful is shown by the decision of the Prussian Government to erect two new technical high schools—at Dantzig and Breslau.

We have recently been insisting in the "JOURNAL" upon the value—the driving power, in business—of enthusiasm. Dr. Rose lays stress upon the possession of that virtue by both teacher and student in Germany. Speaking out of an experience extending over a period of twelve years as student, assistant, and lecturer, in the lecture rooms and laboratories of the Karlsruhe Technical High School, the Berlin University, the Prussian Physical-Technical Institute, and other State and private laboratories, he says:

The degree of earnestness and application to work, displayed alike by professors and students, was found commendable in the highest degree; and practical analytical and research work was most materially assisted by the number of German text-books of all branches of chemistry, and by the lavish and practical equipment of the majority of the laboratories. The salaries of the professional staff are, to British ideas, comparatively insignificant, and are only attained to after long years of service. And yet the professors and lecturers possess a profound and sound knowledge of theoretical and practical chemistry, and are earnestly intent upon imparting the same to the students committed to their care, irrespective of nationality. The students with their modest annual allowances show a degree of intelligence, of steady perseverance in theoretical and practical work, which is most admirable. . . . . I have been above all things most favourably impressed by the signal capacity of the German student of chemistry for independent chemical research work; and it is fairly beyond reasonable doubt that to it the great advance of German chemical science and industry is mainly due.

As Dr. Rose further remarks, zeal, industry, and enthusiasm are in a peculiar degree essential to success in the study of chemistry—whether for purely scientific or for industrial purposes; and the foregoing account of the spirit in which teachers and learners alike enter into their work may be commended to the thoughtful consideration of the rising generation of chemist engineers in the gas world, and to those responsible for their training. Enthusiasm, like faith, can remove mountains.

In a further article, we will consider Dr. Rose's account of the present position of chemical industries in Germany.

THE DIRECT PRODUCTION OF MOTIVE POWER FROM BLAST-FURNACE GASES.

THE utilization of blast-furnace gases for heating air for the blast for the furnaces and for raising steam is now a comparatively old practice, dating, according to some authorities, from the middle of the last century; though it does not appear to have become general in this country until the close of the sixties. The gas engineers who visited the furnace-gases plant at Calder in connection with the recent Engineering Congress at Glasgow, witnessed the utilization of blast-furnace gases for both these purposes, with, however, one important advance over earlier practices—viz., that the gases had previously been treated for the complete extraction of the tar and ammonia which they contain when in the crude state. Steam required for operating the apparatus for the extraction and working up of these products was produced in boilers fired with the previously treated gases. In a works of this character, live steam is frequently blown into the stills, &c., and is therefore more or less indispensable. For obtaining power, however, it is clearly an uneconomical procedure to burn blast-furnace gases for raising steam for operating engines when it is possible to utilize them directly in internal combustion motors. The ordinary gas-engines of types familiar to engineers up to less than a decade ago would, however, utterly fail to grapple with the vast problem of the adequate utilization of blast-furnace gases by reason of the immense production of these gases. Something capable of reproduction on a larger scale was needed, as no multiplication of the number of small motors would meet the conditions involved in the question of the production of power from blast-furnace gases at a sufficiently cheap rate to warrant a brisk demand for it.

It is unnecessary to recapitulate here the thermo-dynamical considerations which lead to the conclusion that the heat from the combustion of gaseous fuel should be better utilized in an internal combustion motor than in a boiler and steam-engine, since they are familiar to engineers, who also know that practical results bear out the theoretical conclusion. A case in point will be recalled by those who have taken an interest in the recent development of motor-cars. The popular fuel for them is well known as "petrol," which is a light petroleum like carburine. In most types of car, the petrol is consumed in an internal combustion motor or gas-engine; but in a few it is used as boiler fuel for the generation of steam for driving the car. Now the consumption of petrol per mile run is very much greater in the latter type of car, which, however, survives—despite the high fuel consumption—because of its superiority in respect of freedom from noise, vibration, and liability to failure.

Experience is now proving that the blowing engines for blast furnaces can be driven direct by gas-engines at a far lower consumption of the gases from the furnaces than is required to drive them through the medium of a boiler. The saving of power that may thus be effected has been variously estimated, but in any case is considerable. The question is discussed by Professor G. Lunge in an article on "The Utilization of Blast-Furnace Gases for the Direct Production of Motive Power" in "The Mineral Industry," Vol. IX. This article is somewhat superficial, like Professor Lunge's contribution to the same volume on "The Manufacture of Water Gas," which we noticed last week (p. 781). But it is at times highly suggestive; and some of the data which are quoted from authorities such as Professor Hubert, of Liège, Professor E. Meyer, of Göttingen, F. Lurmann, and the Cockerill Society, may be referred to here with advantage.

In the first place, an annual output of pig iron throughout the world of about 40 million tons is attained by the consumption of at least 50 million tons of coal, most of which is converted into coke before it is used; for only a few varieties of coal will resist the enormous crushing force to which the fuel in a blast-furnace is exposed. The Scotch furnaces, indeed, are still able to obtain a supply of good splint coal for their purpose; and in only a very few is a small proportion of coke used. But the supply of this coal is approaching exhaustion; and in most other districts coke is the common fuel for the furnaces. But even so the descriptions of coal from which really suitable coke can be made are none too common; and the continual growth of the world's output of iron renders it a paramount duty to reduce as much as may be the consumption of fuel per ton of pig iron, in order to stave off as long as possible the time when all the readily available supplies of good coke-yielding coal shall be exhausted.

Fortunately, the enormous waste of coal which prevailed in the iron industry in the early part of last century is now quite a thing of the past. Then 8 tons of coke were commonly consumed in producing 1 ton of pig iron; but by 1850 improvements in the furnaces had reduced the consumption to 3 tons. An immense advance was made when the waste gases began to be utilized; and in 1899 the huge furnaces at the Duquesne works, near Pittsburg, each producing 600 tons of pig iron per diem, consumed only 0·77 ton of coke per ton of pig produced. Strangely enough, it would seem that it is in the United States, where coal is more abundant and is more cheaply won than elsewhere, that the greatest economy in its use in the iron industry is attained. As, theoretically, the heat required for the reduction of ferric oxide and the fusion of the iron is supplied by the consumption of 0·29 ton of carbon, or (say) 0·33 ton of good coke, per ton of iron, it would appear that there is not room for any very substantial improvement on the Duquesne works figures. The most hopeful field for further economy of fuel certainly lies in the utilization of the furnace gases in gas-engines.

The furnace gases have a calorific power of from 23 to 28 calories per cubic foot, or (say) about one-sixth that of coal gas. Nevertheless the gases yield in a gas-engine over three-fourths of the power which coal gas would give. It is estimated that upwards of 160,000 cubic feet of blast-furnace gases are produced per ton of pig iron made. The heating power of the gases is estimated to average about 50·5 per cent. of the heating power of

the coke used in the furnaces. Now only about 30 per cent. of the gases are required for heating the air-blast for the furnaces; hence there is fully 35 per cent. of the heating power of the coke available for other purposes, among which the supply of power for the blowing-engines and minor apparatus attached to the furnaces must be included. Now if a boiler heated by the furnace gases were employed for driving the blowing-engines, &c., nearly the whole of this power would be used up for that purpose only. But if the gases were utilized in gas-engines, there would remain a surplus of 20-horse power per ton of pig iron available for quite extraneous purposes.

The utilization of the enormous power which this quantity represents in all the great iron-producing countries, is a problem fraught with immense possibilities in the way of economizing the national resources. That there is in nearly all cases an outlet for its profitable employment, is scarcely to be questioned. It may be for the generation of electricity, either for lighting purposes, or for industrial uses. For manufactures such as the production of aluminium and calcium carbide, for which water power is still eagerly sought, there is clearly a good prospect for the utilization of the surplus power from blast-furnace gases. Indirectly, if not directly, the gas industry must feel the effect of the application of this hitherto unapplied power to industrial purposes. But any technical advances which tend to husband the coal supplies of the country will not be unappreciated by gas managers, many of whom have witnessed the gradual exhaustion of the best seams of cannel, and do not wish to see the day when the best gas coals shall similarly become scarce.

Meantime, it is interesting to regard the advances in gas-engine construction which have rendered available the immense store of power previously lost in the blast-furnace gases. The pioneer blast-furnace gas-engine was, as is well known, a 30-horse power motor established at the Wishaw Iron-Works in 1894. This application in Great Britain was rapidly followed up both in Germany and Belgium; for trial was made of a 12-horse power Otto engine at the Hoerde Works in October, 1895, and of a 4-horse power Simplex engine at Seraing in December of the same year. Then followed a most rapid development at both these works. At Seraing, the Cockerill Society erected in 1899 a 600-horse power engine, on which very favourable reports were issued by several experts who witnessed trials made in March, 1900. The results were so successful that Professor Lunge states, in the article mentioned above, that the Society now have orders on hand for 71 gas-engines aggregating 35,000-horse power; while they are preparing to build them of a capacity of 2500-horse power. The Cockerill engine, however, is now well known by repute—at least, in this country. At Hoerde, however, 600-horse power motors of another type have been erected. They are to the design of Herr W. von Oechelhaeuser; and as they have been almost ignored in articles such as that by Professor Lunge, though highly interesting and giving great satisfaction, we propose to refer to them at greater length in a subsequent article.

DESTRUCTION OF TOWN REFUSE BY FIRE.

A YEAR ago, we noticed, under the heading of "Electric Lighting Memoranda," the communication of Mr. M'Taggart, the Cleansing Superintendent of Bradford, to the British Association, on the working of the dust destructors of the city. The notice will be found on page 690 of Vol. LXXVI. It laid stress upon the breakdown of the much-advertised combination of dust destruction and electricity generation, and showed that as the result of a complete fortnight's run at Midsummer, the "Horsfall" plant in question completely negatived the idea that the heat of incineration of the town's rubbish would be worth anything for electricity generation. Among other curious revelations of this paper, one of the most impressive was that it had not been usual for the working results of refuse destructors to be given for so long a period as a fortnight. Our republication of these Bradford statistics drew down on us the reproaches of people who were interested in the performances of certain dust destructors elsewhere; and during the year that has since elapsed, we have received various additions to our store of information upon the general subject. One of these is a book, constituting a number of the "Engineering Times Library of Technical Manuals," entitled "The Economic Disposal of Town's Refuse," by Mr. W. Francis Goodrich; and published by Messrs. P. S. King and Son, of Westminster. It is not a work we should undertake to review in the ordinary course; being devoted to a subject rather remote from our usual studies. It does, however, come incidentally under our notice, mainly in connection with the false pretence that is made by interested parties in respect of the possibility of cheapening the cost of electricity production by the use of destructor generated steam; and therefore we will briefly test the value of Mr. Goodrich's contribution to the literature of the subject.

In the first place, Mr. Goodrich is to be commended for putting in his preface the uncompromising declaration that he looks upon the generation of power as a distinctly secondary function of a destructor; the first being that of thorough and innocuous destruction. Much trouble has arisen through misunderstandings of this prime condition. The author goes on to say that, though the production of steam power as an incident of refuse destruction is not to be unduly valued, it is nevertheless a natural and inevitable result of this operation when conducted in a properly-designed plant. The worst of accepting this proposition is that it begs the question of what is a properly-designed plant. According to the argument, it is a plant that generates steam. But this conclusion reverses the order of importance of the two results—refuse destruction and the generation of steam thereby. Pushed to its logical end, the argument is that the best refuse destructor is the one that generates the most steam, which is inadmissible. The danger in taking as an asset an incidental result of the working of a process ostensibly used for a different main object, is that a definite yield of this asset is expected. An irregular return on this account is of little value for any purpose. Consequently the interest, whatever it is, which is asked to deal with such an asset, is usually driven to protest that, unless it knows in advance what it has to depend upon, it would infinitely rather do without the thing altogether.

Very much is written and spoken concerning the advantages of "utilizing" the refuse of manufacturing operations, and other kinds of rubbish. While not overlooking the obvious consideration that this is a proper and paying thing to do when the bye-product or refuse of one industry is the raw material of another, it must not be forgotten that there is much true economy in throwing really useless or spent substances away as cheaply as possible. Ample experience proves that sewage and town's refuse is matter to be got rid of as thoroughly and cheaply as possible, because there is no value in it. It is absolutely good for nothing, and at the time cries for removal from any place where it might be a danger to health. This being so, the problem of getting rid of such matter is first a sanitary, and secondly and lastly an economic, question. There is no justification for posing the destruction of town's refuse by fire as preferable, on the ground of principle, to any other thorough disposal thereof, as by barging out to sea, or filling up waste places on the earth. The noxious compound gets reduced to its elements in the end, whatever is done with it; and that is the utmost that sanitation requires. To admit any prior claim on behalf of cremation, is to concede a point to sentiment; and that way lies waste of money, and any amount of unsuspected trouble. No community with ready access to the deep sea for its refuse, or with ample and unobjectionable tips for the same rubbish, would be justified in preferring to burn it, with all the extra expense and dependence upon the human agent.

There are, of course, many populous places which cannot dispose of their rubbish in the natural manner; and it is a good thing for them that nowadays there are other means of getting rid of it unobjectionably. Here let us remark that Mr. Goodrich is a thick-and-thin partisan of burning the rubbish. He is not willing to admit even that sinking it in deep water is a "final" disposal of it. Like most partisans, he sets instances of imperfect practice of his opponents against an always presumed perfection of his favourite method, and so triumphantly claims a verdict for the latter. It is a simple way of engaging in a controversy; but it fails to carry conviction to those who are in search of facts on both sides. It will not do, however, to rate Mr. Goodrich as a controversialist, or even a writer; for his literary and critical gifts are not of a startlingly high order. Those who purchase his book will do so probably more for the sake of the collected data relating to works in operation than for the compiler's opinions. Again and again the compilation betrays the defect so strongly condemned by Mr. M'Taggart, of working results being given on a selected test of a few hours' duration. This weakness destroys confidence in many statements of duty rendered for refuse consumed, where the conditions of the test are not given.

The modern improvement in destructor working upon which Mr. Goodrich sets most store, is the introduction of forced blast, with the consequence of high-temperature working of the furnaces. A pattern of destructor which embodies this feature is put upon the market by Messrs. Meldrum Bros., Limited; and by a coincidence we have received a reprint of a paper read by Mr. J. A. Priestley, of Nelson, at the recent Annual Congress of the Royal Institute of Public Health, upon the realized performance of a Meldrum destructor in that town, of which Mr. Goodrich could only speak by anticipation. We have mentioned the matter of the duration of destructor tests, and laid stress upon the unsatisfactory character of those short runs, which, however valuable as contractors' tests of the general efficiency of the plant, do not teach anything on the important head of what the user has to expect of the working in the long run. Mr. Priestley has improved upon Mr. M'Taggart in this respect, inasmuch as he has published the result of a complete four-weeks working of his new Meldrum plant, from Feb. 19 to March 16 last. This, be it observed, is not the same season of the year as that covered by Mr. M'Taggart's test; the fact of domestic fires being used at the time introducing a disturbing element of unknown magnitude. The fuel value of the Nelson refuse must therefore have been pretty high, as the evaporation by the Lancashire boiler used was after the average rate of 1·85 lbs. of water per pound of refuse. It is fair to state that the boiler is not fixed in the best position for steaming—that is, where the furnace gases are hottest; but these are allowed to burn themselves out before touching the cool boiler plate, in order to avoid the slightest possibility of creating a nuisance.

There remains the question of what best to do with steam thus generated. Mr. Goodrich was full of the notion that this incidental product should find its use in the generation of electricity for lighting and power purposes; the modest uses of the mortar

mill and the clinker crusher being despised by him as imperfect. Mr. Priestley, however, is not so sure. He declines to commit himself as to the most satisfactory application for the steam produced, but thinks the ideal arrangement would be "some class of work which would provide a demand for the steam continuously as it was produced, rather than a heavy demand for an intermittent period"—like electric lighting. That is a sensible opinion, but open to the request that this desirable application should be named. For the asserted economy of refuse burning hangs upon the possibility of selling the steam to advantage. At Nelson, the very excellent plant gives refuse a fuel value equal to one-fifth that of coal, on the spot, which locally means 2s. 6d. per ton of refuse, as fuel. The cost of destroying the refuse amounts to 2s. 5d. per ton, everything included; so that, if the steam could only be sold, the plant would pay for itself. The worst of this position is that refuse destructors, like blast-furnaces and coke-ovens, must work as they can, and wherever they are; so that their superfluous heat is not so marketable as it would be if it were handier to a good consumer. Hence it is to be feared that refuse destruction will go on costing the Nelson ratepayers 2s. 5d. per ton, while the profitable utilization of the steam is coming.

THE STORY OF THE GAS INDUSTRY IN BIRMINGHAM.

THE "Birmingham Magazine" is an example of a class of literature which, in such centres of the arts and industries as the city from which the magazine takes its name, may serve a very useful purpose. If well and carefully conducted (as this certainly appears to be), and if kept free from the trammels of party matters and outside the petty strifes of men, it can do much in the way of focussing light upon places and subjects and upon men and things, in manner and style beyond the scope of the general newspaper, and with that nimble touch which draws the attention of the ordinary reader. The second number of the third volume of "The Birmingham Magazine" is such a production; and we wish, for the good it would do, it could be placed in the hands of every citizen. It is called the "Gas-Works Number." Cursorily looking through the pages, they appealed to us for favourable notice; and, on carefully reading the subject-matter, we are glad to give it, with one little reservation. It is this that, beyond the interest that obtains in some of the illustrations, there is little in the production which will appeal to the gas technicist. But we do not think the Editor intends it for other than local readers, and such outside as desire knowledge of what is going on in the Birmingham gas world. The chapters are written in a chatty style, and the tale told is compounded of just such information as has a popular flavour. But the expanse over which the articles rove—from the time of Murdoch down to the reduction of the illuminating standard of the South Metropolitan Gas Company's supply—is proof that the writer has been well-informed, and that he has been painstaking in accumulating and arranging his material.

Nearly the whole of the "Magazine" is devoted to the one subject—the gas industry in Birmingham, not merely in respect of the actual gas supply, but of the manufacture of gas appliances within its bounds. Much of the matter is historical; the first chapter entirely so. There the story of Murdoch is retold; and in connection with it a photograph is published of Murdoch's house in the Queen's Head Road, Handsworth, where he died on Nov. 15, 1839, at the advanced age of 89. This was the first private residence to be built with gas-pipes laid in. For this reason, and more because Murdoch resided and breathed his last there, we regret to learn that the house "is about to be demolished." Is it too late to raise a cry for the preservation of the place as a memorial, or is the site too valuable to allow the house to stand? The gas industry is not, as most other industries are, rich in memorials to its dead creators. A small tablet here and a bust there for Murdoch, and a stone over the grave of Winsor in a back path, far away from the usual walks of men, in a huge Parisian Cemetery, are practically the sum of the possessions of the gas industry in this respect. "The results of their work are fitting memorials," some may say. True, to an extent; and the argument comes in handy for those who have enriched themselves from the work of the pioneers, but who do not seem inclined to move a finger or spare of their substance to show their respect and thankfulness in another form. Again we ask, Is it too late to save Murdoch's dwelling? Historical marks of this kind have an indefinable charm; and with the destruction of this one, little that was part and parcel of Murdoch's life will remain to us.

We have wandered a little from our task. The writer of the "Magazine" articles found it an easy passage from Murdoch to a statement about the early days of gas lighting in the city. Ten years after Winsor had shown a few gas-lamps in London, the first gas-works were erected in Birmingham. This was in 1817; and they must have been constantly seen by Murdoch. Their situation was just off Broad Street; and the approach to them was called Gas Street—a name which is all that now remains to indicate their location. These particular works were taken over by the Birmingham Gaslight Company; and a few years after (1825) the Birmingham and Staffordshire Gas Company was formed. We cannot follow the essayist through his interesting story, especially as the history of the gas supply of Birmingham, from 1874 when the Right Hon. (then Mr.) Joseph Chamberlain proved to the satisfaction of Birmingham that it would really be advantageous to purchase the two Companies, is known to most of our readers. To those who are not acquainted with it, then they cannot do better than get a copy of the issue of "The Birmingham Magazine" now under review. But having arrived at this point, the writer breaks off to introduce a chapter made up principally of photographs and biographical notices of members of the Corporation Gas Committee, who control what are later termed "the largest municipal gas-works in the world." So extensive are the operations carried on, that the annual income now approaches £900,000; and so successful has been the conduct of the works that the rates of the city have directly benefited to the extent of nearly £700,000. These are figures to which the writer seems to refer with some pride; but (very rightly in a non-controversial periodical) he shuns comment on the righteousness or otherwise of having drawn this enormous sum from the pockets of the consumers of gas for the benefit of the ratepayers generally. At the same time, we hope, if this article or the "Magazine" should fall into the hands of councillors in towns where the gas supply has not been municipalized, that the glitter of the £700,000 will not cause them to imagine that what Birmingham has done they could do also proportionally with their size. The day has passed when a local authority could purchase a gas undertaking, and end 25 years after with a quarter of a century's record such as, or in the same ratio as, Birmingham can present to-day. For their success, all honour to the men who have managed and engineered the vast concern.

In the next chapter, the history of the undertaking (which was broken off to give some particulars about the *personnel* of the Committee) is resumed. There we learn that the transfer of the Birmingham Gas Company's works took place on Sept. 1, 1875; the purchase money (£450,000) being paid by cheque. The works of the Birmingham and Staffordshire Company changed hands on Jan. 1 of the following year; the payment being by perpetual annuities amounting to £58,290. Compare then and now! The capital account to-day stands at £2,400,000, a set-off against which is a reserve fund of £100,000, together with a sinking fund of £613,450. Following up the writer, he makes allusion to the secretarial work of the department. Two years after the works were purchased, Mr. Henry Parry was succeeded in the secretaryship by Mr. Edwin Smith, of whose work the absence of an acknowledgment would have been a serious flaw in the articles. At the end of January this year, it will be remembered, Mr. Smith retired, and was followed in the office by Mr. G. Hampton Barber. The writer goes on to give details of the different branches of the business, and then comes two little sketches of the professional careers of the two Chief Gas Engineers—Mr. Charles Hunt and Mr. Henry Hack, both of whom have been identified with the Birmingham gas supply since 1872. Over the manufacturing plant, the writer passes very lightly; but he does not leave the subject of production without reference to the questions of residual products, carburetted water gas, and Mond gas. Seeing that gas is more than ever used for its heat-giving qualities, he asks, As gas to answer present-day requirements can be produced at a lower cost than that now supplied, shall not Birmingham have such a gas? Did he conceive this inquiry, or was it prompted?

Leaving the Birmingham gas undertaking, the "Magazine" writer gives an account of a visit to the Birmingham meter works of Messrs. Parkinson and W. & B. Cowan; and here we get another little glimpse into the past—

> It is of extreme interest to us here to note that from the earliest days of the Birmingham Gas Company, who were the first in this town to supply meters to consumers, the inventors or their successors have supplied the meters used in the Birmingham district. . . . These meters are made in Birmingham by Messrs. W. Parkinson and Co., who, with the forward spirit of the age, have recently amalgamated with Messrs. W. & B. Cowan, a firm established in 1827. By the amalgamation as Messrs. Parkinson and W. & B. Cowan, Limited, they became not only the oldest, but the largest, makers of gas-meters. The Parkinson branch was founded in 1816 by the inventor of gas-meters, Samuel Clegg, who was an assistant of William Murdoch, and entered into partnership with Samuel Crosley. . . . The Bell Barn Road works (established in 1830) were purchased from Messrs. J. Bent and Son in 1890.

In this connection, a further point of interest may be mentioned. The Parkinson branch, it is stated, have made and repaired 1½ millions of small and nearly 2000 station meters. This is a record worthy of a boast.

In the succeeding chapter, the manufacture of gas-fittings is noticed; and the works which come in for treatment are the huge ones of Messrs. Evered and Co., Limited. We have the authority of the "Magazine" for saying that this establishment is the only one in Birmingham where the raw material goes in at one end and the finished fittings come out at the other. This chapter is not by any means the least interesting of the series. The final chapter deals with the advantages of the Welsbach system of lighting.

Altogether this gas number of our Birmingham contemporary is well done. There are 26 pages devoted entirely to gas matter and illustrations. The latter are delightfully clear and splendidly printed—especially so the photographic reproductions of the men who guide the fortunes of the gas industry in the city. Those of Mr. Henry Hack and Mr. Charles Hunt are remarkably good; but the pleasure depicted on their countenances, we are afraid, will lead the laymen readers of Birmingham to imagine that the responsibilities of such colossal gas undertakings as they have in charge are of the lightest.

MODERN GAS APPLIANCES.*

ROUND about the main current of technical gas literature, there have recently sprung up several side-streams of semi-scientific periodicals, which, no doubt, in their way, have added in some degree to our store of knowledge, and have answered to the public desire for popular information. It is satisfactory to note, as our columns have borne witness from time to time, that the subject of gas manufacture and supply comes in for its fair share of attention in such publications; as it is, in part, evidence of an increasing general interest in such matters, and (provided that the accounts given be accurate) can only redound to the welfare of the gas industry at large. Such thoughts are suggested by the publication in book form of articles contributed to "Feilden's Magazine," under the title of "Modern Appliances in Gas Manufacture." It is really the work of a trio, one of whom, unhappily, is no longer among us. The late Mr. G. Ernest Stevenson had written but two of the six articles when he was struck down by the deplorable accident in Manchester on Oct. 30, 1899. His pen was taken up by his brother,† who now appears responsible for the publication; an appendix on "Carburetted Water Gas," by Mr. S. Cutler, jun., being added. The last article was noticed at length in the "JOURNAL" at the time of its publication in "Feilden's Magazine," and calls for no further comment.‡

It is always somewhat difficult for a technician to write a satisfactory series of articles on his speciality for more or less popular consumption. This difficulty is probably increased when his readers possess some technical knowledge, but not of his particular kind. In such a case, he can either ignore their partial training, and explain himself in the simplest language possible, or he can assume their understanding broad principles, and general processes, and write practically as he would for his technical brethren. The former method is undoubtedly the safer and more successful. To try to combine the two we believe to be courting failure, as the exposition will be too involved for one class of readers, and not full and satisfying enough for another. This danger has not been altogether avoided in the book under review. Some explanations are eminently simple and easily understandable by all, while other passages assume a considerable degree of familiarity with the reasons for, and functions of, the apparatus described. The result is that the tyro is occasionally bewildered, and the expert sometimes annoyed. It must be said, however, that the author has given a good general review of present-day gas-works appliances, and has traced their developments from their early beginnings. His views are sound, being based on practical experience; and the investigating student need have no fear of accepting the facts and figures presented. He will not, of course, find (as it is not possible within the limits of six short chapters), a complete account of modern gas plant; but he may gain a very good idea of the lines on which to continue further studies.

Without any introduction, the subject of stoking machinery is at once plunged into; its well-known history, with dates and names, being recorded. Chapter II., with the heading "Inclined Retorts, &c.," proves rather disappointing, and hardly as "modern" as it might be; while its general arrangement is somewhat confusing in its sequence. After a few opening remarks, the inclined retort installation at the Gaythorn works of the Manchester Corporation is described, followed by an account of the coke-conveying plant there. Then comes a brief summary of the advantages claimed for the system of "inclineds," with mention of the pioneer work done by Mr. Frank Morris and others; and finally an exceedingly short consideration of other methods of handling coal and coke. Surely this is the reverse of the accepted, logical order: Coal handling, inclined retorts (past and present), coke conveying.

Mr. Fletcher Stevenson's work really begins with the following chapter on "Condensers and Exhausters," reviewing one or two water-tube examples of the former, and various patterns of the latter, and adding a few notes on steam governors, controlled by the gas made. Washers and scrubbers in their different forms are rather fully considered, and purification and purifiers led up to; the subject, though so important, not being treated in such a way as to make the why and the wherefore of it very easy of comprehension. Interesting figures are given relative to the cost of constructing purifier-boxes on Mr. Henry Green's system, followed by mention of the centre-valves in use, and the means adopted for handling the purifying material. The last chapter describes the developments that have taken place in gasholder construction, and concludes with a few remarks on station governors.

Some of the above subjects are treated with a brevity that amounts to abruptness; while the final sentence of all, relating to governors, brings the reader up with quite a jerk. Perhaps space considerations for the original articles have something to do with this; but brevity does not necessarily mean that smoothness must be sacrificed. The author's style, though fairly clear, is hardly attractive; there is no reason why a technical work should not be written as interestingly as possible. There are one or two oversights in proof correcting; and the penultimate letter of the word "conveyor" is sometimes an "o" and sometimes an "e." The illustrations are many and good, though the printing and paper do not strike one as being of such fine quality in the book as in the periodical form. These are small points, however, and need not be considered by anyone wishing to have brought before him a short, general survey of some of the latest appliances used in the manufacture of coal and water gas.

* "Modern Appliances in Gas Manufacture." By Fletcher W. Stevenson, M.Inst.C.E. London: The Feilden Publishing Co., Ltd.; 1901.

† A letter referring to this matter appears in our "Correspondence" columns to-day.

‡ See Vol. LXXV., p. 921.

MOND GAS ONCE MORE.

WHATEVER may be the financial possibilities of the system of power gas production invented by Dr. Ludwig Mond (and they remain to be proved), the idea has certainly met with a good deal of support from an engineering point of view. Indeed, the subject has recently been so much before the public, that one might be pardoned for concluding that everything possible—both for and against it—had been advanced. Whether or not this is the case, the question is once more dealt with at some length in a communication from Sir Frederick Bramwell, which appeared in the "Correspondence" columns of "The Times" last Wednesday. The letter is headed "Parliament and Municipal Trading;" and the author states that his object in writing it is his "desire to call attention to the way in which Parliament, by two of its Committees' decisions, has stood up against the municipal trading bogey." The incident to which he alludes is the Mond Gas Bill; and, as an "introduction," he gives a description of the Mond system, and enumerates the advantages claimed for it. With the description of the process it is unnecessary to deal, as our readers are by this time well acquainted with it; and most, at any rate, of its advantages apply equally to all producer-gas plants.

The letter, however, contains some interesting allusions to the subject of gas power generally. Sir Frederick calls to mind the fact that twenty years ago, at the Jubilee Meeting of the British Association, he prophesied that in fifty years' time "steam-engines would be found only in museums." Though this was merely intended as a figure of speech, the development of the gas-engine since that time has been so great that he believes his prophecy will be very largely fulfilled. We believe so, too; and we see no reason why a fair proportion, at least, of the supply of gas for power purposes should not fall to the established gas companies and corporations. In addition to the many other advantages enjoyed by the gas-engine over its older, but most extravagant, rival, Sir Frederick contends that the universal replacement of steam-engines by gas power would save four-fifths of the coal that the former now consume. "Is it too much to say," he asks, "that, having regard to our rapidly falling stock of coal, it is a positive sin to spend five times the needed amount?"

The way in which Parliament has stood up against the municipal trading bogey in regard to the Mond gas scheme, is next demonstrated. It is pointed out that the area covered by the Bill extends to 135 square miles, broken up into 27 different authorities—giving an average area of exactly 5 square miles to each. Twelve petitioned against the Bill; and seven of these were gas authorities, while others possessed electric lighting works. "Remonstrance and opposition to the monopoly sought by municipal traders has for once prevailed," however; and the Act applied for has been obtained. The obvious answer to the authorities who opposed the measure, Sir Frederick says, is: "Why are you to go into trade without running the risks of trade, and why are you to stop improvement?" Obvious as this retort may be, we are not at all sure that it covers all the points raised by the opponents to the Bill; and, in any event, the corporations concerned can hardly be blamed for endeavouring to reduce the "risks of trade" to a minimum by keeping possible competitors at arm's length.

GAS HEATING RADIATORS.

THE approach of the season of domestic fires is marked this year by the appearance in the market of a household warming appliance using lighting gas for this purpose in a manner possessing several points of novelty. The fact is to be welcomed on principle, irrespective of the precise degree of merit of the new comer, inasmuch as the bulk of the trade in so-called "gas-fires" has fallen into a deep rut. Speaking broadly, there is no material difference between the various makes of gas-fires that actually occupy the market, as regards efficiency, price, or appearance. We have on several occasions recorded the prevailing judgment upon the merits and drawbacks of these stock goods; and to judge from the latest advertisements in the "JOURNAL," the latest is hardly distinguishable from patterns of last year and the year before. There has been progress of a kind; but it has consisted during late years of concentrating the trade upon the two main divisions of gas-fires, requiring a chimney flue, and condensing "stoves," which are merely luminous burners in cases. There have disappeared from the larger commerce all other classes of gas warming appliances that have been put upon the market from time to time.

It is unnecessary to discuss afresh the characteristics of the "gas-fire," in which the great bulk of the trade is done. Nobody pretends to like or to admire it for its own sake. But it sells, and people use it for the want of anything better. This "something better" has hitherto not been attained in practice, whether regard be had to acceptability of appearance, efficiency of operation, or

price. Perhaps, consequently—at any rate, certainly—all the makers of this class of gas apparatus are simply vieing with one another on points of detail in construction or of pattern. They appear to understand one another in respect of selling price and trade terms, for all stock patterns; but one never hears nowadays any claim made for improved efficiency. Even the non-firing-back burner, which was made such a feature of a few seasons back, has "gone quiet." This is what we mean by the assertion that the gas heating appliance trade has fallen into a rut. There it is; and the old firms do not stir a finger to lift it out.

This adherence to list patterns is doubtless sound business practice. "Standardization," it might be possible to call it, in big language; but it has the grave inconvenience of leaving outsiders to bring in any improvements, if they can be devised. Now, it is not for us to say that the manufactures in this line of the Kern Burner Company, Limited, are in fact an improvement upon the standardized "gas-fire;" but it is true that they are a novelty, that they do not at all resemble the ordinary gas-fire with its sham "fuel," and that they appear to be put upon the market by a firm commanding ample means and energy to make a strong bid for custom. It is these "Gas Heating Radiators," as the articles are termed in the price-list, which we set out to describe as a new aid to householders for combating the cold of the coming winter. It, of course, remains to be seen whether they will take the popular fancy, or not. On some important accounts it is rather likely that they will; although they are not, any more than the ordinary gas-fire, a perfect substitute for the English coal-fire. Still, there is plenty of room for a good gas warming appliance that can fairly claim to be efficient and reliable, if not as absolutely beautiful as fire itself.

The new manufacture of the Kern Burner Company, for heating purposes, is called the "Clamond Gas Radiator;" and this designation will sufficiently indicate its character to gas engineers who have followed up the development of the incandescent use of gas. It is an adaptation of the famous Kern atmospheric burner to render incandescent for heating, by radiation (instead of lighting), an appliance which in this case is a perforated, vertically-disposed, fire-clay cylinder. The whole arrangement, in brief, is a row of these cylinders mounted upon a Kern burner, instead of a single incandescent Welsbach mantle—and that is all! These elements of the construction are, of course, embodied in a variety of patterns and sizes of so-called "radiators"—we are glad they are not called "fires," or "stoves," as in truth they are neither—but they remain always the same. There is the well-known double-cone gas and air mixing tube (but placed horizontally), which makes the celebrated "self-burning mixture." This tube opens into a barrel, which contains a perforated thin metal liner, as in the Kern lighting burner; and the superior outlet from the barrel is a number of round holes, which take as many simple cast-iron nipples. Upon the latter are mounted the fire-clay cylinders, which are quite loose, and changeable by anybody. The virtue of this device is its candour and simplicity. The radiating elements make no pretence to be anything but what they are—plain, perforated, fire-clay tubes; and one can have them larger or smaller, in a row of five or more up to ten, according to the power required. There is nothing to get out of order or wear out; and nothing carelessly thrown against the hot tubes can fall down into the burner. It is almost needless to state that the cast-iron mounting of the radiators is excellent; and all the fittings are of first-rate quality. Although the appliance is essentially light and compact, it is not flimsily made.

The system of warming, by direct radiant heat, is the same as that of the ordinary "gas-fire," with the advantage of a better radiating effect due to the hotter element, aided by a white reflecting back-ground. What this may mean (in money) to the user remains to be proved. No particular degree of efficiency, as a burner, is ever claimed for the usual gas-fire burner; and the relative position of "fuel" to the atmospheric flame is in this case a matter of accident. This condition of affairs is altered in the Clamond radiator, where the burner is of the very best, and the attachment for converting the heat of the atmospheric flame into radiant heat, is adjusted as accurately as the analogous incandescent lighting mantle. The claimed result is that the consumption of common coal gas per element of radiation is 2 cubic feet per hour; and that five of these elements combined in a "radiator" will sufficiently warm a medium-sized room for a consumption of 10 cubic feet of gas per hour. The statement is vague; but if true it will serve. There is an admitted difficulty in the reduction of work of this kind to an exact quantitative expression. Cold weather will test the Clamond Gas Radiator; and nothing else is worthy of attention. All the test-room experiments that have ever been made with gas or any other kind of heating appliances never influenced their fate; except in ruling out the obviously inefficient. The first necessity is that a heater shall warm a room quickly enough. People will not have patience with anything that cannot make itself felt for an hour or two after lighting up. The man who comes down to breakfast early on a cold morning, or goes to his office afterwards; or the lady or gentleman who suddenly realizes about bed-time that it is a cold night, and that a fire up-stairs would be pleasant—these are the mainstay of the gas heating trade, and they will not wait. This is the consideration that distinguishes British house-warming practice from the Continental or the American. It is a "flash-heat" that is wanted, at the moment, rather than a constant warmth as of hot-water pipes warranted to go on for weeks and months unchanged.

For this reason, it is the custom of gas engineers to recommend householders contemplating the adoption of a gas-fire for a living room, to have a pretty powerful one while they are about it. They are no uglier, and not much more costly, than the small ones; and there is the advantage that as soon as they have done their work of taking the chill off the air, they can be turned out altogether. Under these conditions, the large gas consumption of such an appliance does not condemn it utterly in the reasonable opinion of a sensible man who perceives what he gets for his money. The crucial question for the Kern Burner Company is, whether by their arrangement they can do the work of an ordinary gas-fire for a sensibly reduced gas consumption. There is nothing else in it. They have no speciality in the use of radiant heat, which is common ground with all makers of "gas-fires" of the modern kind. The Kern burner is not at all noisy in operation, with pressures under 1 inch; and it does not light-back. But, as we are advised, all these recommendations, of positive value as they are, sink into insignificance beside the main question of whether, in this Clamond radiator, gas manufacturers have at command a domestic heating appliance burning gas, which they can conscientiously recommend for continuous use over long periods, at a cost not exceeding that of a coal-fire. In other words, as the ordinary gas-fire is an expensive convenience when used over any length of time, is the Clamond radiator a saving arrangement in this respect, without loss of heating efficiency? The experience of the next two or three years will show.

It is worthy of remark, for general interest, that the Clamond radiator is the only commercial application yet attempted, for heating purposes, of an approved gas illuminating device. It has always been recognized that an intensified gas-light was also the most effective gas-fire; but difficulties which eventually proved insuperable always interfered with the realization of this perception on a practical scale. Mr. Frederick Siemens tried his best to adapt his regenerative system of gas lighting to gas heating: but the only arrangements that satisfied him on the score of efficiency were far too expensive for the general trade. Whether the Clamond heat radiator will answer as well, from the point of view of the gas consumer, as the Welsbach light radiator, is the hazard upon which the Kern Burner Company have elected to try their fortune; and we are perfectly certain that the British gas industry will watch the issue with interest stimulated with the sporting desire that the best competitor may win.

ELECTRIC LIGHTING MEMORANDA.

Mr. Yerkes and the Metropolitan Railway—The Rival Schemes—Yerkes upon Ganz—A Damaging German Official Report.

THE schemes for electrolizing the London underground railways have apparently progressed, in the heavy-footed fashion usual with railway reforms, so far as the stage of a clear division between the two Companies, which it will be for the Board of Trade to deal with. Recent newspaper reports accuse Mr. Yerkes, the Chairman of the Metropolitan District Electric Traction Company, and master of the Railway Company of the same name, of trying to fix responsibility for delaying the plans for the change of system upon the Metropolitan Company. The Secretary of this Company denies the impeachment, and says that the business would all have been arranged, and the work under way, if Mr. Yerkes had not put his finger into the pie. It is of a piece with the general ignorance of such matters on the part of the public, that many newspapers should have treated their readers to a variety of glowing, and, of course, nonsensical, accounts of the wonderful "system" which Mr. Yerkes, the millionaire from Chicago, is about to introduce into the London railway system. The notable himself has contradicted these stories, explaining that he has no system, that he is no electrician, but is merely what in the America is called a railway "boss." The institution is so foreign to English railway methods that the British public still do not understand where Mr. Yerkes "comes in."

The public, it is pretty safe to declare, never will learn the peculiarities of American railroading. But many of those who do know the part taken by Mr. Yerkes in the proposed Metropolitan District conversion, hold that this astute personage has merely played the old game of buying for sixpence something which he hopes will bring him in a shilling. The net result of Mr. Yerkes's interference is that his English railway is to be charged twice as much for electric traction in the American style, provided through him, than the same thing could have been bought for in the open market. Henceforward the way to the market is barred to the District Railway. It remains open to the Metropolitan, however; and at the other end is the Hungarian firm of Ganz & Co., who are willing to do the job both cheaply and well, according to report. Originally, as part of the game, Mr. Yerkes pooh-poohed the Ganz system. He would never put a dollar into a high-tension alternating current plant; and so forth. Meanwhile, not recognizing in him either a competent or an unbiassed judge of the matter, the Metropolitan Company made arrangements for Messrs. Ganz & Co. to come over here and explain their plans to the satisfaction of the Board of Trade.

This the Hungarian firm agreed to do; but just at the same time it pleased Mr. Yerkes—unbeliever as he was—to go to Budapest with three engineers, and inquire into the Ganz system on the spot. So important a visitor, of course, locked up at home

the principals of the Ganz firm, who were accordingly delayed in the matter of preparing for the Board of Trade arbitration. Inasmuch as Mr. Yerkes expressed himself as satisfied with what he saw, this interruption was not regarded as of great importance, because it looked as if there would be no arbitration after all. However, early in last month Mr. Yerkes definitely informed Messrs. Ganz that he would not have anything to do with their system. Then, he blandly accused the prospective customers of the firm of delaying their plans. If there is any meaning in these "alarms and excursions," it cannot seriously interfere with the ultimate settlement. The plans, wherever originated, for applying electric traction to the two Metropolitan Railways will have to be sanctioned by the Board of Trade, in the interest of the public; and the particular desires and schemes of any shareholder will not affect the decision of the Department.

The observation we made in this column last week, to the effect that American railway interests did not see their way to work a certain tunnel in New York by electricity, is supplemented by a remarkable piece of Berlin news published in the "Standard" for the 26th ult. This statement is that the Prussian Railway Administration has published a report on experiments in electric railway traffic on the Berlin-Wansee line, and elsewhere. These experiments, it is said, have shown that electricity as a motive power for passenger trains is not inferior to steam; but it is much more costly. In fact, the main obstacle to the exclusive adoption of electricity for railway working is an economical one. "The Railway Administration has declared its willingness to place lines suitable for electric traffic at the disposal of any parties who would run trains at their own risk; but no one has accepted the offer. It is clear, therefore, that electricity must be made cheaper before there is any chance of its being extensively used for this purpose." Here is an official statement which the partisans of electric traction for railways will be well advised to investigate in their own interest. It may be susceptible of criticism, or it may even be possible to explain it away altogether; but unless and until this is done, those who respect German official science will think very seriously of it.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 854.)

BUSINESS on the Stock Exchange last week was a good deal put out by an influence which blew from an unusual quarter—viz., the copper trade. Here there was a rather serious upset and fall in prices. This dragged down the American market; and from one thing it spread to another, so that prices all round in the leading departments are lower, but not much. The Funds and other Government Loans receded in the face of the free borrowing that is going on, and the fear of more to come in order to pay for the war. The Money Market opened very easy, but drew in tighter as the week went on, in response to the requirements of the Stock Exchange settlement, and the usual demands at the end of the month. In the Gas Market, however, there was no adverse influence—neither copper nor hard money nor anything else; but things moved brightly and buoyantly. The holiday season is not yet sufficiently closed to warrant the expectation of great activity; but still there was a very fair amount. The process of recovery in Gas Stock prices generally, to whose certain advent we have from time to time referred, progressed gaily; and a considerable number of important issues made further solid advances. Per contra, there was no relapse. In Gaslight issues, the ordinary was still pretty brisk, although not so extremely active as in the preceding week. From a mark of 97 on the opening day, it pushed steadily up, and on Friday it just touched 100—a figure which it had not sighted for a long period. The secured issues were moderately dealt in, and presented no noteworthy feature. South Metropolitan was rather quiet, and made no offer to advance. Commercial was only dealt in once; but the quotations had a smart advance. In the Suburban and Provincial group, although transactions were limited, the business of advancing prices was in full swing. All Brentford issues had a good rise, and other gainers were British and Southampton and Sheffield in the local market. The Continental Companies were quiet, but strong; and Imperial and Union improved their positions. Among the remoter undertakings, Ottoman and San Paulo showed advances. Actual business in the Water Companies was still only limited; but the upward march made by nearly all quotations was extraordinary. Reference to the table on p. 854 will show how many and how large were the advances, reaching in one instance to 12 per cent.

The daily operations were: Gas was fairly active on Monday; and Gaslight ordinary rose 1. The same issue was very active on Tuesday and rose 1 more. Union and Imperial also rose 1. In Water, East London rose 10; Lambeth, 5; Kent, 4½; Chelsea, Grand Junction, and West Middlesex, 3; Southwark, 2; and Lambeth 7½ per cent., 1. Gas was quiet on Wednesday. Commercial old rose 4½, and ditto new 2. In Water, Chelsea, East London, Lambeth, Southwark, and West Middlesex rose 2; and Lambeth 7½ per cent., 4. On Thursday, Brentford old rose 3. ditto new 2, and ditto preference 4½. In Water, Lambeth and Chelsea preference rose 3, and ditto 5 per cent., 2. Friday's business in Gas was only moderate. The sole move was a rise of ½ in British. Saturday was much the same as usual. Brentford debenture rose 2, Imperial 1, and Southampton 1.

NOTES.

Incandescent Lighting in French Lighthouses.

It is known that the French lighthouse service is of supreme excellence; but it is scarcely realized that the immense advance that has been made of late years in the quality of the lighting of the French coast and harbours is largely due to the readiness with which the engineers have availed themselves of incandescent gas lighting. A paper on this subject was contributed by the Baron Quinette de Rochemont, the Director of the Lighthouse Service, at the Glasgow Engineering Conference. The author claimed that one of the chief improvements has been the adoption of the "lightning flash" system, which has been greatly aided by the availability of incandescent burners for compressed gas or petroleum vapour. The great recommendation of the incandescent lights, apart from their intensity, is that they can be used over a long period, and have greatly improved the lighting of those secondary points which are nevertheless of vast importance to navigation. All the French lighthouse apparatus has been revised in the light of this new practice; and many powerful lenticular arrangements with incandescent gas-lights have been substituted for the old catoptric appliances. This is especially the case with lightships. The author described a new vessel so fitted; compressed gas made on the Pintsch system being used. This is on account of its capability of bearing compression to 150 lbs. without any troublesome condensation. It has been found that low-pressure incandescent gas lighting is too feeble for lighthouse purposes. But with compressed gas, the quantity of gas supplied to the mantle, and the rate of combustion, vary in proportion to the pressure; while the dimensions of the incandescent body remain unaltered. The temperature of the mantle, and its intrinsic brightness, are therefore correspondingly increased. The burner used is a simple vertical tube, with a needle-point gas-injector worked under a constant pressure of 2¼ lbs. per square inch. The burner once regulated goes on for hours, without attention, with a rated intrinsic brilliancy of 2 carcels per square centimetre in the mean horizontal local plane.

The Nernst Electric Lamp—American Pattern.

In various quarters it is reported that the long-expected Nernst incandescent electric-lamp is at last to make its appearance in actual street-lighting service. Although it will probably be prudent to wait and see this done before accepting it as a fact, it may be useful to describe the Nernst lamp as it is said to have been developed by the Westinghouse Company for the United States. It is a German pattern of the article which is being prepared for English consumption. As made by the Westinghouse Company, according to a statement by Mr. A. J. Wurts, the Nernst lamp is composed of a "glower" compounded of a paste of rare earths mixed with a suitable binding material, which is pressed through a die, and cut off into lengths that are afterwards dried and baked. The "glower" for a 220-volt circuit is 25 millimetres long by 0·63 millimetre in diameter. It is a non-conductor when cold. The best results are obtained when the glower is enclosed in a glass globe. The heater used to render the "glower" conductive on lighting up consists of a porcelain tube wound with fine platinum wire pasted with cement, a pair being used to every "glower." These heaters are cut out automatically so soon as the current passes through the "glower." They last a long time, and their scrap value is 90 per cent. of their first cost. The "glower" lasts about 800 hours, without much rise of voltage. It is necessary to place a steadying resistance in series with it, because, beyond a certain point, the resistance of the material diminishes with any increase of current. After all these points have been attended to, the net result is that the watts used per candle power on the Nernst system are about one-half the consumption of ordinary incandescent lamps. The more powerful lights are multiples of the smaller units; there being no difference of manufacture. A number, aggregating over 55,000-candle power, have been working at Pittsburgh for some time; the average life being about 800 hours. It would seem to be easier to make Nernst lamps for the high pressures now in vogue, than in the case of the ordinary vacuum incandescent lamps; but the comparative cost is not stated.

Gas from Town's Refuse—A Boston Failure.

It does not appear to be generally known that a system of town's refuse disposal was installed and operated in 1898-99 in Boston, Massachusetts, which combined the Arnold reduction process with a method of ammonia recovery involving the use of bye-product coke-ovens. An illustrated account of this experiment, which seems to have ended disastrously, appeared in the "Engineering Record" for the 14th ult. The system was in operation only about six weeks before the plant was partly destroyed by fire; "and a combination of circumstances prevented its reconstruction in its original form." The mere destruction portion of the plant, however, it still used. The combination of ammonia recovery with refuse destruction was the idea of Dr. Bruno Terne, who patented his arrangement in the United States. It was brought before the Semet-Solvay Company, who tested 20 tons of pressed deposit in their coke-ovens at Syracuse. These tests showed that from a ton of material, containing 40 per cent. of moisture, there were obtainable 163 lbs. of ammonia, reckoned as sulphate, 488 lbs. of carbonized matter, and 4000 cubic feet of gas of about 300 British thermal units calorific value, together with a

small quantity of tar. On the basis of these results, the construction of a coke-oven plant to deal with Boston street refuse was undertaken. The enterprise seems to have been solidly started in conjunction with the City Sewerage Department, and must have cost a good deal of money. The idea was to elevate the refuse out of barges, press it to get rid of as much of the moisture as possible, and carbonize the residue, after it had been sufficiently dried by the agency of waste heat. The gas made by this material in the Semet-Solvay ovens was just powerful enough to keep them going; but they had to be started and equalized by the aid of a pair of Taylor gas producers. The residue of carbonization was a light granular substance, seemingly of no particular value. An elaborate ammonia-recovering apparatus was attached to the plant; but history is discreetly silent as to the results of its operation. No attempt was made to rebuild the plant after the fire.

OBITUARY.

The wife of Mr. JAMES STELFOX, of Belfast, died suddenly on Friday last. This simple announcement will be read with universal regret in the gas industry; and the sympathy of professional brethren from far and near will go out to him who is now mourning an irreparable loss and a painful severance.

The death is announced of Mr. JOHN LITTLEWOOD, a member of the well-known firm of Mangnall and Littlewoods, architects, of Manchester, and brother of Mr. William Littlewood, formerly of West Bromwich and now of Tiverton. Messrs. Littlewood, in 1878, obtained the first prize of £500 for their design for the Bradford Road station of the Manchester Corporation Gas Department.

It is with sorrow that we have this week to announce the death of Mr. GEORGE R. GLOVER—a son of the late Dr. Glover, and a relation of Messrs. Thomson and J. W. Glover. These gentlemen were all associated in the firm of Messrs. George Glover and Co., of Chelsea; the deceased holding a partnership for the long space of thirty years, and devoting himself more particularly to the commercial side of the work. On the amalgamation of the concern with Messrs. Richmond and Co., Limited, under the style of the Richmond Gas Stove and Meter Company, Limited, Mr. George Glover took the positions of Vice-Chairman of the united Company and Managing-Director of the meter business. He has not been spared long to hold these offices; for after a few weeks' illness from pneumonia, he passed away on Monday last week—the sad event taking place at Bournemouth. Mr. Glover was of a retiring disposition; but his geniality and tactfulness made him a great favourite of all with whom he came in touch both within and outside the business.

PERSONAL.

Mr. A. E. MOTTRAM, late Assistant to Mr. Charles Potts, the Secretary and Manager of the Hyde Gas Company, has been presented by the employees with a gold and diamond scarf hoop, as a memento of over sixteen years' service among them, on his leaving to take up the position of Gas Manager to the Ossett Corporation.

It is with feelings of regret that we learn that Mr. MARK OLDROYD, who has represented Dewsbury in the House of Commons for the past thirty years in the Liberal interest, has resigned his seat. Mr. Oldroyd will live in the recollection of many readers—London ones more particularly—for his conduct, as Chairman, of the proceedings on the Gaslight and Coke Company Bill, the South Metropolitan Gas Bill, and the Portable Photometer Bill in the session of 1900.

The Gas Committee of the West Bromwich Corporation have selected Mr. HAROLD E. COPP, the Assistant-Engineer of the Stockport Corporation Gas-Works, as their Engineer in succession to Mr. Thomas Glover, who proceeds to Norwich this month. The appointment has to receive the approval of the Town Council; but in the meantime we may congratulate Mr. Copp upon his prospective elevation. The salary is £450 per annum. There were nearly 50 applicants for the appointment.

During the short time that Mr. ALEXANDER ALLAN has been at Nelson, as the Engineer of the Corporation Gas-Works, he has not failed to distinguish himself, and has won the affection of the Corporation officials generally, and especially of those with whom his work brought him into intimate touch. In consequence, his appointment to the engineership of the Scarborough Gas Company has been met by his colleagues with mixed feelings of gratification and regret—gratification upon Mr. Allan's success and the recognition of his competence for higher things, but regret that his elevation removes him from their midst. Mr. Allan left for Scarborough last Tuesday; but on the preceding evening the heads of the Nelson Corporation departments gave him a farewell dinner at the Lord Nelson Hotel, and presented him with a handsome spirit stand as a memento of his association with them. The Town Clerk (Mr. J. H. Baldwick) occupied the chair; and toasts suitable to the occasion were honoured. In acknowledging their rich testimony of friendliness towards him an assurance was given by Mr. Allan that he would always retain a warm corner in his heart for the Corporation officials at Nelson.

COMMUNICATED ARTICLE.

GAS MATTERS IN THE UNITED STATES.

A QUESTION OF STATUS—AND STOVES.

In reading the papers published in the "JOURNAL," one can not avoid remarking the prominence given to the science of gas making, as distinguished from the art of distilling coal, if I may so frame the antithesis. The status of the gas-making industry in Great Britain seems to stand midway between the positions it occupies on the European Continent and in the States.

On the Continent, it is distinctly a chemical industry. The gas-works manager produces gas; but he makes numerous other things in like manner. Having to manufacture these various bye-products in order to secure a dividend, he purchases each special appliance according to his experience of his needs. At least, this is the impression made on my mind by observations on the spot. The German gas-maker (as he conceives himself) is a manufacturing chemist, part of whose product is illuminating gas, which he sells to the householders for fuel and light, because he cannot at the minute find any better use for it. From this standpoint, the chemical examination of the product is important; and an accurate knowledge is an essential condition of success, from which it happens that real investigations into the product are made by men who know how to use the means of investigation—real chemical analyses, not make-believe ones; real determinations, both photometric and calorimetric. It is certainly not my intention to say that I saw no "fake work" in Germany. *Per contra*, I saw lots of it; but the impression made on my mind by the average worker was in favour of his honesty, even if it was against his sound common sense. I often saw Germans and Dutchmen doing things which, had they been the acts of an Englishman, would have been demonstration that a swindle was in contemplation. Done by an American, such acts would impeach his sanity, simply because no American has the smallest taint of scientific curiosity. My experience and observation impress me with the following theory: A German will investigate for the sake of the investigation; an Englishman will investigate to obtain information which he desires; and the American will avoid study if he can, will study by proxy if study he must, and will read the most carefully written report and miss the real intention of the writer. As a final result, when German societies meet, we read contributions to our knowledge of the science of gas making; the Englishmen discuss its practical application, the art of gas making; and the Americans instruct the world on the art of selling—not gas—but stoves.

AT THE BEGINNING.

In order to understand the attitude of the gas-works man towards science in general, its human exponents, and towards "gas experts" in particular, it is absolutely needful to remember: First, that the present generation of gas managers obtained what education they have in the works (to them "the works" is preparatory school, college, and university all in one). Secondly, that such a works' graduate believes firmly in himself and in his system. Not only is he certain that everything taught in the works in which he has grown up is the truth and nothing but the truth, but also that it is the whole truth; and when a man brought up in another works voices another opinion, the average American suspects him of tampering with the facts. This peculiar mental attitude is never lost. The average American has neither the inclination nor the ability to include in his mentality an experience at variance with his own. The result is a peculiar contempt for everyone who dares to even hold an opinion without "conviction." When an American fifty years old or so who has never been to college tells you he is "convinced" that a thing is true, you may be sure he will deny the evidence of his own senses before he will yield this "conviction."

In respect of his attitude towards the gas industry, certain facts must be remembered. For example, these: While the American colleges are turning out men year by year infinitely better fitted to fill the place of a gas-works manager than the best stove-sellers of the lot, these schools are not supplying the gas-works with managers. So manifest is it that the men must be better instructed, and so certain is it that places will be given only to the "practical men," that influences have combined to teach the gas men—the men in the works, with the hope and intention—to make them less incompetent. Indeed, nothing is more obvious to a man who is inside than the significant absence of data of a strictly scientific sort. If strictly scientific data are forthcoming, it is the work of some "college man who was put in by his father who is a director. They all do that—write a paper during the first year; try to make us change something, but we don't; and they either fall into our ways or leave," and of the data by which results can be judged none whatever is forthcoming. If it exists, it is not regarded as material for use at the meetings of societies. If anyone doubts this statement, let him look through the American journals and find the scientific contributions made by gas-works managers, or by anybody else, which will compare with the papers read at the societies in England or on the Continent.

Again I say the Germans write papers on the science of gas making; the Englishmen on the use of this science—the gas makers' art; and the Americans tell us how to sell stoves. In

America every improvement in either the science or the art has originated outside the works, usually in the private study of the despised college-trained men.

Attitude Towards Investigations.

I have hinted that a German will investigate, object or no object; the Englishman if he sees a reason. The American will avoid investigation altogether, if such investigation implies accurate routine work extending over a prolonged research period. By an American, I mean a member of the Anglo-Germanic race, all of whose great grand parents were born on this Western Continent. This American will follow a clue with infinite zest and sagacity; he will accumulate an immense file of materials on some subjects; but he simply cannot stand the peculiar strain implied in doing the same thing over and over a hundred times a day, maybe for a hundred days, and all this time keeping his attention fixed on what he is doing. If he manages it at all, he either goes mad or else becomes self-hypnotic. This is my own opinion, formed from studying the men; it is also the opinion expressed in Court by three very expert mental disease specialists in the American Continent. As a result, we find that in the American chemical laboratories the men who make the routine volumetric tests are either recent emigrants—Swedes, Germans, or Dutchmen—or else they are Americans or Englishmen who have to be used for lack of better. But while the "importation" can be trusted to make the same kind of analyses every day for weeks, the American or Englishman must have his work changed "to rest him," or he becomes quite unreliable—not from inattention, but from inability to make his attention conscious. This is no exaggeration, and no traveller's tale; it is an acquired characteristic of the race, and must be treated as such. It is an acquired inability to attend to small details often repeated.

This characteristic has a direct bearing upon the value of American data, renders them at all times subject to question, and at the same time makes the American loathe the accumulation of those long series of observations which alone are valuable. Times and again I have seen gas analysis apparatus purchased for the use of a chemist, who would begin work with enthusiasm, only to abandon it, on the ground that it was "too much like slavery," before enough data were accumulated to have any value. Of course, the mistake was made which nine men in ten make—the Hempel technical apparatus was the one chosen. While this is a most excellent auxiliary to either one of what Hempel justly calls "the exact method" apparatus, it will not do when used alone. This short-lived enthusiasm is characteristic. They really intended, did these various men, to study the gas which they made and the gas which other men made, and to understand what the men who discuss the composition of gases were talking about. But they could not stand the strain; the drudgery of collecting data was too much for them. Until a new generation comes to the front, one which can collect data and fill up blanks, without any thought beyond filling up those blanks accurately, this country will be scientifically a lost Continent. The gas-works may attain to a certain perfection in manipulation, and to a certain economy in working; but the managers will never know what they are making in the way of product, and they will never miss the knowledge. There will be no improvement until they begin to bring in from outside men with the training needed to make an advance by studying their product, as the product should be studied—that is, scientifically.

The excuse for this ignorance and apathy has been sought in the obscurity of the relation between chemical composition and candle power. I have been answered thus when I stated what seemed to be wanting. "The obscurity of relation between the chemical composition and illuminating power destroys this interest in the process of analysis. Just you watch how persistently they use the photometer and the calorimeter." I wonder if the gentleman in question, himself the president of a large gas company, had by chance any notion of the implicit condemnation of the very men he intended to defend. Be the reason what it may, they do not, and they cannot, collect scientific data; but they can sell gas-stoves. Perhaps this is really what they are paid to do. If so, someone else should be paid to make analyses, and to use the calorimeter and photometer as they should be used.

I accepted the suggestion of the president of the gas company, and began seeking information in regard to the use of the photometer and calorimeter. Within a week after the suggestion was made to me, I visited five gas-works, with the following result, which is taken verbatim from a memorandum in my diary, made on the spot. It chanced that these five all had Junkers calorimeters. The manager of the first works said he made it his business to run a calorimeter test every Monday morning; and his assistant ran one on Wednesday and Friday if he had time. In the second case, the calorimetric measurements were made by the manager's private secretary, a very intelligent young lady, who said she did not understand the machine, but followed the directions. In cases three and four, tests were made whenever there was time—about once in a month. In the fifth case, the manager said: "The great advantage of the Junkers calorimeter is that an education is a useless luxury for the man who uses it; and as we have to keep a man here at night, I make him useful by having him test the gas with the calorimeter and take measures with the photometer. He collects the data, and my stenographer works up the figures when she has time." This manager explained to me that "all instruments of precision are useless about a gas-works; for the data obtained [by the watchman] showed very great variation in the heating power and in luminosity; but the gas users made no complaint." He kindly showed me the original slips, and some of the data which had been worked up. It would seem from these that a variation of 15 per cent. in luminosity on consecutive nights was not rare by any means; and as great, or slightly greater, variations in the calorimetric values were not at all uncommon. The most interesting fact in this connection was pointed out to me by the stenographer. The highest reading for candle power which was obtained between October, 1899, and March, 1900, was coincident with the lowest calorimetric value! What sort of an opinion can anyone form in regard to such data? Can it be called scientific, by any stretch of courtesy? The president's son, who is vice-president of the gas company, and a graduate of one of the big schools, said to me: "Once in a while I go to the works and get some data to go by. Of course, you know our manager amounts to nothing scientifically; but he has doubled the output in less than five years, and a big dividend covers a multitude of scientific shortcomings."

It would not be much of a job to increase these tales fivefold, and then to duplicate them by tales in reference to the photometer. In one case, the local paper contained an article on the very superior quality of gas being delivered by the company, as shown by the photometer. I visited the town the next night but one; and the superintendent showed me the photometer, and said "Measure it yourself." I made the measure; but when I came to examine my friend's standard candles, I caught on. The fact was as any one might have suspected—the "standard" candles were at fault.

I am hardly willing to say *ex uno disce omnes*, because if there were brave men before Agamemnon, there are probably honest and careful men in the gas business. But they are unhonoured and unsung. They do not sell gas-stoves enough for this; and there is a heavy handicap against them. Every prejudice in what it is the fashion to call the "American mind" is against the value of a special education.

Variation in the Oil Used for Enriching Gas.

This important fact in gas manufacture is causing much discussion, some heated comments, and not a little discontent. I have incidentally made mention of the comfortable theory that, while the kind and amount of gas which a hundredweight of coal would make was to some extent an indeterminate quantity, the oil-gas men pretended to say that their process knows no variation. Curiously enough this declaration does not agree with the facts. Even the same brands of oil, so to say, do not always have the same physical constants; and the necessity for finding out the proper working temperature for any given supply of oil is a source of much trouble. The gas men are also complaining that now, when so many oil areas are being opened up, they are furnished with oil from the nearest source of supply, often getting a kind to which they are utterly strange, and sometimes to which the machine is not adapted. There is no need for me to go into details, although time, place, and circumstance could be given. This variation of constants has greatly increased my supply of specimens, and is one of the items which incline me to the belief that in the future we shall see in every large gas-works a testing laboratory in the hands of a skilled analyst; and since the very small companies cannot afford this, a co-operative contract will be made by which they can jointly maintain such a really useful adjunct. When this comes about, I think that we shall see other improvements which will surely follow directly the skilled analyst can be obtained. The hints given in relation to the use and misuse of the photometer and calorimeter would not apply were these instruments in skilled hands. If the Hempel technical apparatus and all its progeny to the remotest relation could be done away with, what was left behind would cover all the needs. What is wanted is an apparatus which will measure the smallest change clearly, carefully, and certainly.

A Possible, but Improbable, Future for the East River Gas Tunnel.

A story became current in three different clubs last Sunday evening about the same time, which seemed to be traced to definite individuals who had been down the harbour in the steam-launch of a noted gas engineer during the afternoon. These gentlemen appear to have set the story going, although they most vigorously denied any knowledge. The story is, in effect, as follows: You, of course, know there is a tunnel under the East River connecting the manufacturing plant on Long Island with the distributing plant on Manhattan Island; and this tunnel comes in between Forty-first and Forty-second Streets. As it stands now, it is simply a hole to carry gas-pipes; but it could very easily be enlarged. Everyone knows that the New York Central and Hudson River, Harlem Railroad, and the Consolidated—the largest combination of terminals about the city, and the only one on the island—is also in Forty-second Street. The Pennsylvania and the other lines are planning a bridge over the Hudson somewhere south of Forty-second Street, or at least not north. The "Herald" said it was going to have a certain location, so we are ready to bet it will be somewhere else—probably Forty-second Street, since the "Herald" said it surely would not be there. You will remember I told you of permission to build a huge gas-works at Port Morris, on the Harlem River, just where it joins the East River and the Sound. So much for the scenery; now for the play, which, after all, is the thing. The story that was started on Sunday evening was this: The Consolidated is to shut

down its distributing station near Forty-second Street and the East River, and is to cease using the tunnel after Jan. 1, 1903. The Pennsylvania Railroad, per the Long Island Railroad, which it leases in perpetuity, will then take possession of the tunnel and enlarge it, opening it so as to connect with its bridge, which will come in at Fortieth Street, making the bridge from the Jersey shore and the tunnel to Brooklyn nearly a straight line. The present gas-works on Long Island, at Astoria, will supply the demands of Long Island, extinguishing all the small plants now in use; and the huge plant at Port Morris will by this time be ready to supply Manhattan and the Bronx.

In view of the fact that those who are credited with telling the story in the three clubs are men who might well have known all about it, one cannot but feel that maybe it is true—especially as it fits in so exactly with the stories which have been previously told. There is no other circumstance connected with New York City's recent history which shows so well its tremendous growth, as does the rapid increase in demand for gas and the enormous plants prepared for making the supply equal the demand.

The Philadelphia Gasoline Disaster.

On the surface, this affair is nothing but an explosion of gasoline mixed with air in the back room of a group of squalid tenement hovels inhabited by tradesmen of nearly or quite the lowest class known to the community, accompanied by a large loss of life among the dwellers in the said tenements, and by a surprising destruction of property in the shape of windows, mirrors, and fine china some three or four hundred yards distant. To the expert, it tells of the danger of permitting the sale of 74° gasoline, and *à fortiori* the hydrocarbons of lower boiling-point, in a city whose summer temperature is quite likely to rise above the "boiling-point" of such hydrocarbons. The force of the explosion at first suggested some recognized high explosive. But the proof that gasoline would account for all the facts, has discounted the dynamite theory. Presumably some of your readers are familiar with the antics of 74° gasoline. Those who are not, may find the following interesting.

In many United States cities 74° gasoline is permitted to be sold in 10-gallon cans, which cans are furnished at the bottom with a faucet, and are corked with a screw cap, which effectually seals the can air-tight when closed. Some of these cans are also furnished with a valve by which air is let in to empty the can, but which closes against any escape of vapour. These cans are expensive, and are used only when the law compels it. Usually with the simple sealed can the tension of the vapour is sufficient to empty it; and if it is not, the cork is loosened while the can is being emptied, and is then screwed down firm again. Since the tank attached to a gasoline-burning stove holds about a gallon by measure (American gallon), it is customary among the users of these stoves to fill a pitcher or the like from the large can, and with this to fill the tank of the stove—thus putting a premium on accidents. I have investigated a number of gasoline fires for insurance people; and it is not rare that we find gasoline is left in the pitcher or pint pot used to fill the stove, which, evaporating, has become the source of the accident.

In houses and tenements in which gasoline is used for fuel, the smell of the vapour is always present, so that no suspicion is excited. Even with a gasoline air-gas plant of the most approved pattern, the horrible smell is still present; consequently no one would pay any attention to the smell as a danger signal. Now 74° gasoline has another curious habit in respect to explosions. Being a mixture of pentanes, hexanes, and heptanes, it gives off vapours of differing densities and ignition points; and if there is a great relative excess of vapour—say, that the vapour represents 16 per cent. of the air-vapour mixture—it will not ignite, much less explode. But if the air is increased so that the vapour forms only about 4 per cent. of the mixture, and flame comes in contact, the result is a partial explosion of wonderful incendiary power, but very little destructive tendency. This is the usual result of a gasoline explosion—a broken window or two, and a fire which burns everything in sight. On the other hand, if the amount of air is just a little greater (the exact quantity depending on the temperature), and the vapour has had time to mix with the air and "laminate," as the technical phrase goes, and is then ignited, the explosion will have almost no incendiary effect; but the way in which it will rend and tear things is simply appalling. This vagary being held in mind, one can form an idea of what happened. The 10-gallon can of gasoline was not closed tightly; the temperature of the room was far above the boiling-point; the flat was closed; and the gasoline had ample time to evaporate, mix with the air throughout the building (the tenants had been absent at least nine hours), and convert the whole five rooms, with only two outside windows, into a mine filled with "fire damp." Then, being slightly heavier than the air, the explosive mixture settled to the bottom of the air-shaft and drifted in, by way of an open window, to the next building, in which was burning a common kerosene lamp. No more perfect infernal machine could be imagined. The four walls of the block were all blown outwards, and the roof fell in bodily. It is to be hoped that some means will be found to stop the use of gasoline in climates where the summer heat puts it into the condition of a vapour under tension.

Gas Explosions in New York, and the Proposed Remedy.

The underwriters in this city are becoming indignant. They have for a long time past been provoked and worried at the number of gas explosions. The vast majority seem to be due to the flueless cookers, and other like pieces of apparatus. Certainly some kind of precaution should be taken to insure that when the gas is turned off it stays turned off. "An automatic fastener"—patented, of course—is shown fitted with a cam and a spring. This stopcock has only two positions. It is either turned on full, or it is closed automatically. A very considerable amount of force is required to open it (so that it cannot be opened by accident), and the least touch closes it. There seems to be an opinion that this is a perfect protection; and there is some considerable pressure being put on the insurance people to get them to require its adoption. It would be a very good thing if some such device could be made compulsory—not only on gas-stoves, but everywhere. The only objection would be the complaints on account of variation in the gas pressure, and the fact that the light could not be turned down. This, however, could be met by one of the various yoke burner attachments; the gas being turned on full at the fixture and regulated at the burner.

Those "Baby Mantles."

I wrote to you some months ago that a concern which sells thousands of mantles annually had announced—vocally, not in print—that it had made a contract with the Kern people to supply a baby mantle with one-fourth the area of the standard mantle; the notion being that the consumption of gas could be reduced in proportion. The theory, as set forth by the said mantle dealers, was that, since each square inch of Kern fabric, when properly used—that is, fully heated—would give 15 standard candles (these figures are theirs), a properly heated mantle of 12 square inches, the alleged standard size, should give 15×12, or 180-candle power. It is a thankless task to show how far short of the theory the practice comes; but since 180-candle power is quite too large, by reducing the size of the mantle and changing the style of burner, the gas consumption would be lowered to one-third the present amount, and the candle power actually obtained would not be changed. August has passed, and the mantles are not put on sale; and now a very curious story is in circulation. It is said that the gas companies have made representations both to the Kern people and to the manufacturers of the proposed burner, to the effect that they could not look upon such change without displeasure, as tending to reduce the consumption of gas unwarrantably. The especially funny part of the matter, from my standpoint, was this: I was told that the people who wanted to use the mantle as a trade item sell not to the gas consumers, but to the natural gas trade and the gas-machine people. This was the *clientèle* they intended to benefit, not the customers of the gas companies. Thus again we have an instance of Nemesis, of the "Eternal Justice of Circumstances." It may be that I am getting the Yankee disease, self-conceit; but I am sure that if the Manager of the English Welsbach Company could see what is patent enough to us on this side of the salt water, he could quadruple his sales—not in square feet of fabric, but by decreasing the size of the mantle and increasing the efficiency. Why is it that he does not see that size means high first cost, and that the efficiency is far too low? But you are not paying me to write a treatise on the use of fabric. Only mind this, some day a Yankee will land in England, and, having made the stockholders "panic drunk," will buy shares in the English Company, and will show them where they have lost a fortune. If 15-candle power per square inch is the capacity of a mantle, and only $2\frac{3}{8}$ square inches functionates, what is the use of the $9\frac{5}{8}$ square inches remaining, to say nothing of the waste of valuable raw materials?

North of England Gas Managers' Association.—The 49th half-yearly meeting of this Association will be held at Ripon next Saturday, under the presidency of Mr. Matt. Dunn, of Goole. After an inspection of the Ripon Gas-Works, the business of the day (which is to consist of the delivery by the President of his Inaugural Address and the election of new members) will be transacted at the Crown Hotel. In the afternoon the party will drive to Fountains Abbey, returning afterwards to the Crown Hotel, where they will dine together.

American Gaslight Association.—The Twenty-ninth Annual Meeting of the American Gaslight Association will be held in Boston (Mass.) on the 16th to the 18th inst., under the presidency of Mr. Edward G. Pratt, of Des Moines (Ia.). The following papers are to be submitted: "The Analysis of Gas Accounts," by Mr. Paul Doty. "What is a Gas Company's Business?" by Mr. F. D. Moses. "Tar and Water from Water Gas," by Mr. W. E. M'Kay. "Retort-Ovens as Producers of Illuminating Gas," by Mr. T. Littlehales. "Further Notes on Retort-House Practice," by Mr. E. H. Earnshaw. Besides these, there will be two communications (by Mr. A. B. Slater, junr., and Mr. C. F. Prichard), the titles of which have not yet been announced. If the papers are of a sufficiently high standard, the Beal Medal will be awarded to the author of the best one presented. An effort is being made to arrange for a lecture to be delivered during the meeting. In addition to the papers and lecture, the report of the Research Committee will deal with the question of "Pipe Standards" referred to them at the last meeting, and with other interesting subjects. The arrangements for the entertainment of the members and the ladies accompanying them during the meeting have not yet been completed. There will, however, be a banquet on Thursday (the 17th) and an excursion of some kind on Friday. It is also probable that the ladies will be taken for a trip round Boston.

TECHNICAL RECORD.

PICKINGS FROM THE ENGINEERING CONGRESS.

In the eight sections of the International Engineering Congress outside that devoted to Gas, not one produced a paper which would be in complete form useful to the gas specialist. But there are a few from which some interesting points may be drawn; and we have dealt with them in the following paragraphs.

The Premium System of Remunerating Labour in Engineering Shops.—In the Mechanical Section were at least three papers which dealt with questions affecting labour. From these contributions it is apparent that the premium system of remunerating labour has gained ground in the engineering trade. One paper by Mr. James Rowan treated exclusively of the subject; and it was mentioned again in a paper by Messrs. Weir and J. R. Richmond, and in one by Mr. William Thomson. There can be no doubt from the practical experience of the authors that, in the promotion of efficiency and of internal economy, the premium system is a certain factor. To some extent it is equivalent to the method in vogue in a few gas-works of paying the carbonizing men so much per 1000 cubic feet on the production of gas in excess of a given quantity. In Mr. Rowan's paper the system is fully described; and, if we give an example, someone with an aptitude for this kind of thing, may see a way of turning it to account in gas-works management, although it does not go quite so far as we should like to see. It would anyway be easily applicable to fitting work and mainlaying. In the case described by Mr. Rowan, work as recorded on a job ticket is given to a man on a time allowance; and if he reduces this time allowance, his rate of wages per hour, while he is working at the job, is increased by the same percentage as that by which the time allowance has been reduced. It is, of course, apparent that data must be collected for the purpose of arriving at the time to be allowed to do work. In the case of a job being rejected by the inspector, any premium which would otherwise have been earned by the workman by reason of his having reduced the time allowance, is forfeited. Now supposing the time allowance for a job given to a workman rated at (say) 8d. per hour is 100 hours, and the actual time occupied on the job amounts to 75 hours. Then we have 100 hours at 8d. = 800d., against 75 hours at 8d. + 25 per cent. (2d.) = 750d., giving the workman a premium equal to 150d., or 2d. per hour, and the employer a reduced cost = 50d. (The percentage increase, it will be remembered, is that by which the time allowance has been reduced.) Provided the time allowances are equitable to employer and employed, and based on the average attainments of hourly labour, it will be evident from the foregoing that the higher the premium earned by the workman, the greater will be the saving in cost. In a case where the job has to pass through the hands of several operators, each workman engaged upon it receives any premium earned in proportion to the total reduction of time made in completing the whole job. The payment of premiums does not take effect until 5 per cent. has been earned; and thereafter only in multiples of 5 per cent. In the paper by Messrs. Weir and Richmond, it was mentioned that the system has increased the workmen's average drawings by from 10 to 40 per cent.

Mr. George Livesey took an opportunity of looking in during the consideration of the papers, and giving the section his views on the subject. He said his business (the manufacture of gas) was totally different from that of a mechanical engineer, who experienced keen competition at home as well as abroad. But the fundamental motives he had in view in carrying out the profit-sharing principle at the South Metropolitan works ought to actuate engineers also—the benefiting of the employee as well as the employer. Such schemes must be of mutual advantage, or they soon came to nought. The papers read dealt satisfactorily with the employers' view; and at the same time they tended to increase the interest of the worker in the concern to turn out the work to the greatest advantage. From this point of view the premium system was admirable. But he was afraid it fell short in one particular—it did not render the workman any permanent good. The real question was, What did the men do with the money? They worked harder, and used the tools to greater advantage; but he was afraid that, in nine cases out of ten, the money was spent to no purpose. Mr. Livesey quoted the opinion of Mr. George Thomson, a large woollen manufacturer, of Huddersfield, in support of his view, to the effect that such schemes did more harm than good, because the thriftless presumed upon them, and sometimes spent their bonus in advance. His own experience was that such a plan would have been dead long ago in connection with the South Metropolitan works; whereas the scheme which he had carried out had been of real lasting advantage. It was based on an adaptation of the sliding-scale to the advantage of the worker, who secured a bonus according to the reduction in the selling price of gas. From the first, they sought to encourage the men to leave the bonus in the hands of the Company, and allowed interest at the rate of 4 per cent., which, however, had ultimately been reduced to 3 per cent.—the workers at the same time having leave to withdraw their money at a week's notice. About 45 per cent. left their bonus in the Company's hands; but the greater proportion took it out year by year, and it did them no good. Now, it was compulsory upon the worker that half the bonus must be left in the hands of the Company; and for this the workers got shares in the ordinary stock. The result had been that many left in the whole of their bonus; and at the present time about 3000 of the workers owned £140,000 of the stock—about 2000 of the workers having £100,000 of stock. About 90 per cent. of the workers were now saving the whole of their bonus. The result was a permanent gain to the men. From this point of view, he thought that the premium system might be improved upon, because, with a boom in trade, he felt that it was only a case of the liquor bill increasing, and that there was no permanent benefit. Upon the Board of the South Metropolitan Company they had had for more than three years two working-men Directors who had risen to the full dignity of their responsibility, and had become in the highest sense of the word representatives of the Company, and not, as was feared by many, merely delegates of the workers. In this way the employee appreciated confidence. In his reply, Mr. Rowan said he felt that Mr. Livesey's criticism was partly due to his want of knowledge as to the class of men with whom they were dealing in the Clyde district. He (the speaker) felt that the workmen in question were as able to benefit by the increase in their earnings as any gentlemen in the meeting.

Pneumatic Riveting.—In visits during recent years of gas managers to engineering works and to gas-works where holders, tanks, and other similar constructions are in progress, the system of pneumatic riveting has received from them very interested attention. A paper on the subject was contributed to the Mechanical Section by Mr. J. C. Taite. Dealing with shell riveting, the author stated that, with the introduction of the "Boyer" long-stroke hammer, rivets up to 1½ inches can be successfully knocked down; and the pneumatic holder-up has overcome the difficulties of the old method. After describing this instrument, Mr. Taite gave information as to the pneumatic tools used in ship building, and bridge, locomotive, and boiler work. A point of special interest in the paper is where he gives some figures which show the enormous saving effected by pneumatic riveting. The authority mentioned for the first group of costs is Mr. A. B. Manning, of the Missouri, Kansas, and Texas Railway. It is as follows: "Men with pneumatic riveter will average 500 rivets per day for $8·12 = 33s. 3d., or $1·62 = 6s. 7d. per 100. Men with hand power average 250 rivets per day for $9·20 = 37s. 8d., or $3·68 = 15s. per 100." Then, according to the author, the cost in England of ⅞-inch rivets with pneumatic hammer is 4s. 6d. per 100, as against 10s. 6d. by hand—a saving of 6s. However, the fullest advantages in increased output and economy have not yet been reached in this country, owing to the Trades Unions not having, up to the present, allowed rates to be made sufficiently remunerative to the masters. But the enormous saving effected in other countries by pneumatic riveting must soon have its effect in this country.

Metric System in Workshops.—Mr. Arthur Greenwood gave the Mechanical Section an expression of his views on the question as to whether the time has not now arrived when some steps should be taken towards the adoption in our workshops, in a more or less complete form, of the metrical system of weights and measurements. He pointed out that if engineers were to devote themselves simply to the manufacture of machinery required within the Empire, there would be no reason why they should not continue to muddle along with feet, inches, and hundredweights for all time. But the British engineer, having no desire to be content with any such position, has to meet competitors in the countries of Europe and elsewhere where the metric system is universal. Germany has followed the lead of the Latin countries, and has abolished her many standards of feet, and Austria has done the same. Russia continued to honour us for years by using our standards, and still does so to some extent. But in Russia, before very long, the metric system will be as general as it is in Germany. Therefore, argues Mr. Greenwood, if the British mechanical engineer is to hold his own in these markets, it is imperative that he should offer goods to conform to their usages in dimensions and weights. The author presented a grave point for consideration when he said that he could quote numerous cases of orders from France, Germany, Russia, Japan, and South America that might have come into England, but for the reason that the purchasers preferred buying machinery which admittedly was not so good or so suited to their requirements, but which conformed to their metric system. The one serious objection to the change is the cost and trouble; but this is a difficulty that can be overcome if time is taken to bring about the change. As long ago as 1864, our legislators made its use permissible; and it is for the leaders in the various trades most concerned to take the next step. To the mechanical engineer, it is simply a question of rules, callipers, standards, drills, and reamers, which after all, is not very serious. The equivalents can be made from existing standard leading screws in lathes by means of change wheels. The author makes a reservation in the adoption of the metric system; and it is that it would be well at present not to advocate any departure from the Whitworth standard thread. The two systems can and do work admirably together side by side in many shops in France, Germany, Russia, and Sweden. As to the metric system being rendered compulsory, the author says that, Parliament having made it permissible, private initiative should demonstrate that it is practical, and should then call upon Parliament to make it compulsory. Instead of two years which have been advocated as the period within which this should be brought about, the author, with great liberality, gives

twenty years as nearer the mark. In Mr. Greenwood's own experience, very little difficulty has been met with from the men in the use of the metric calliper-gauge. The discussion found many adherents to Mr. Greenwood's argument; but Professor Barr considered twenty years far too long a time allowance for the adoption of the system.

Incandescent Gas Lighting for Lighthouse Purposes.—Before the section devoted to Waterways and Maritime works, three papers were read dealing with the important subject of the lighting and buoying of coasts. In one of them, it was mentioned by Mr. D. A. Stevenson, the Engineer to the Commissioners of Northern Lighthouses, that the illuminant used in the Scottish lighthouses was mostly paraffin. There is only one case where electric light is employed. But in five stations oil gas is used; and at four of these incandescent burners have been fitted. In a similar paper by Baron Quinette de Rochemont, regarding the lighting of the coast of France, he asserted that by the adoption of Auer incandescent burners, for compressed gas and petroleum vapour, a great practical improvement had been effected. In his opinion, it was probable incandescent lighting by acetylene gas would give still better results—at any rate, as regards lighting efficiency.

Power from Blast-Furnace Gases.—The profitable utilization of power from blast-furnace gases was the subject of an extensive communication, by Mr. B. H. Thwaite, to the Iron and Steel Section; but only one part of it calls for notice here. In the invention of the Otto cycle gas-engine, means have been provided by which, the author says, the power generating value of the blast-furnace gaseous effluent can be practically utilized. The latest type of large power internal combustion gas-engines gives a regular day-by-day thermo-dynamic efficiency of more than twice that of the steam-engine under the same working conditions. With the expenditure of some 3 to 3½ cubic metres of blast-furnace gas of a representative calorific value of (say) 106 to 122·6 cubic feet, 1 indicated horse power is developed, and a thermo-dynamic efficiency of 25 per cent. may be relied on in every-day work, although as high a result as 30 per cent. has been recorded. Making comparisons with the "new" system and the steam boiler and engine, he said that in the former there is no thermal loss involved in the distribution of cooled and purified gas. Then the depreciation factor for the gas treatment plant is satisfied by a very small annual charge compared with that required for a steam-boiler plant. The gas-treatment plant does not require the constant and intelligent supervision that is necessary with the steam-power plant. Any kind of water is equally serviceable for the gas plant; but, of course, the gas-engine cooling water must be of pure quality. Granted that the specification of the gas-engine is a satisfactory one, and embodies in its terms the fruits of the costly experience of the early years of development, then, said Mr. Thwaite, this highly efficient thermo-dynamic engine, if fed with blast-furnace gas, physically pure and of atmospheric temperature, will satisfy all the exigencies that are demanded by an appropriate form of electric load. He described the ideal power gas for uniform and steady running as one containing, as combustible volumetric percentage units, some 30 per cent. of carbonic oxide and 3 per cent. of hydrogen. On comparing the analysis of the gaseous effluent from the blast-furnace, it is seen that this ideal condition is closely paralleled. The value of this blast-furnace gas was readily appreciated by Continental engine builders; and with remarkable enterprise they have succeeded in building engines of 1200 indicated horse power that are in successful operation driving electric machinery, both continuous and polyphase, and the necessary cyclical uniformity can be guaranteed.

Coke Making at Oliver.—Oliver is situated just outside the borough of Uniontown (Penn.); and there are located the Oliver Coke-Works, which until recently were the second largest in the world, and will, when contemplated extensions are carried out, take the supreme position. On these works, Mr. F. C. Keighley, the General Superintendent, read a paper before the Mining Section. The paper ranged over the whole subject—giving constructional detail, information on the materials used, method of working, analyses, labour costs, and particulars about the coal mines from which the raw material is drawn; and yet the author had so pithily done his work, that he conveyed to the section, in a brief space of time, all that it was necessary to know about the plant. The location of the works is in the very heart of the choicest portion of the Connellsville basin of coking coal. At the present time, the plants consist of 708 beehive coke-ovens, 12 ft. 3 in. in diameter by 8 ft. in height inside measurement, which are laid out, for convenience in charging, at two different points a few hundred yards apart, and are known as Oliver Nos. 1 and 2. There are 328 ovens at No. 1; and these are laid out in one row of bank ovens and one set of block ovens. These ovens face three loading-wharves and two railway sidings. At No. 2 Oliver, there are 380 ovens; and these are laid out in three parallel sets of block-ovens. The ovens are arranged to face six coke yards, or landing wharves, and four railway sidings. The works were intended specially for the manufacture of coke for blast-furnace purposes; but it will be of interest to place on record, from first hand, the capabilities of an enormous plant of this character. The coal is carried to the ovens by a train of three steel larries (each of 200 bushels capacity) and a locomotive. The charges are sent direct into the ovens from the larries; and the charges are run for regular work as follows: Mondays and Tuesdays, 130 bushels of coal per oven; Wednesdays and Thursdays, 140 bushels; and Fridays and Saturdays, 175 bushels. The output of coke from these ovens for the year ending Dec. 31 last was 466,618 tons. The capacity, if run for full time every day for a year, is 500,000 tons of coke. The coke drawing is all done by hand by means of scrapers and forks; and the coke is loaded at the ovens by the drawer into wheelbarrows, and wheeled directly into the railroad cars, of which there are 400, of 25 tons capacity. The coal is used just as it comes from the miner's pick; no crushing, washing, screening, or slate picking having to be done. The analysis of the coke affords a clear idea of its value and purity. The burning-off process may be for 24, 48, 72, or 96 hours—just as trade requirements or car supply may necessitate. The total cost of making coke on the present scale of wages is not far from 6s. 3d. per ton of 2000 lbs. The 6s. 3d. is made up as follows: Coal, 4s. 4·1d.; yard expenses, 1s. 5·6d.; repairs, wear and tear, 1·6d.; interest, 1·6d.; taxes, insurance, &c., 1·2d.; sinking fund, 0·9d. The yield of the coke from the coal is about 67 per cent.; and there is about 3 per cent. of breeze. It is the intention of the owners of the plant to increase the number of ovens to 1100. In common with other manufacturers of Connellsville coke, no attempt is made to utilize the waste gases and bye-products from the ovens.

PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

(*Concluded from p.* 789.)

A paper entitled "Experience with Carburetted Water-Gas Sets" was read by Mr. A. C. Beck, of Oakland, Cal. It consisted of a description of certain improvements, introduced both with a view of obviating defects and increasing the efficiency of the machines. With a Springer set, having a grate 5 feet in diameter, and superheater 10 feet high, or 15 feet including the arches, great advantage followed the lengthening of the superheater. They were using Coalinga oil, which gives off its distillates at a lower temperature than most other oils. The object in view was to give it a longer exposure, and to run at lower heats. The heats were more easily controlled; and it was not necessary to run the high heats required with the shorter superheater. They were thus able to keep the checker brick cleaner and free from lampblack. They had been much troubled with naphthalene; but with the introduction of the longer superheater, it disappeared as if by magic. Another change made was increasing the diameter of the grate from 5 feet to 6 feet, which was effected without altering the lining of the superheater, by reducing the furnace lining, thus securing 44 per cent. more grate area; and the only difference noticeable outside was an increase in the temperature of the shell from 100° to 130°. Then in the Springer set the space between the grate-bars and the floor was not more than 2 feet; and this limited space permitted the constant condensation of steam, which caused the presence of water in the ashpit at all times—seriously interfering with the condition of the bottom part of the fire. This defect was cured by deepening the ashpit in a cone shape to 3 feet at the centre. In the first operation of the double superheater process, they found difficulty in preserving a uniform condition of the fire, excess of clinkering, and channelling in the lining. This led them to try a better distribution of the blast under the bars, which was attended with very gratifying results, increased capacity with a lower consumption of coal and oil, and doing away almost entirely with clinker. This addition consisted of a piece of 16-inch pipe carried across the ashpit below the bars into which the blast was introduced, having 12 holes, each 3½ inches square, on each side, below the centre line of the pipes, so that they could not get fouled with dropping ashes. The steam was admitted by a 2-inch pipe carried in the crown of the 16-inch pipe, and perforated at intervals, the aggregate area of the holes equalling the full area of the pipe. The result was that, while working under a blast pressure of 9 inches for Mexican coal, or 17 inches for Welsh coal, there was an even distribution of the blast; and the fuel burnt down regularly throughout the entire horizontal section. Formerly the fire would burn down more rapidly, and clinker would form at the point where the air impinged; and whereas any attempt to force the make led to waste of coal and oil, they could now increase the output by 50 per cent. with the same working results. They ran this apparatus for seven months without drawing the fire; and the average working conditions during that period were: Blast pressure 17 inches, nozzle pressure 25 lbs., length of blast 8 min., oil feed 6 min., steam run 8 min., and a down steam-run of 2 min. After six months' running with Welsh coal, Mexican coal was used for one month; and at the end of that time, the furnace was in good condition, with little or no clinker on the side walls and no channelling. With Mexican coal, the blast pressure was 9 inches, the nozzle pressure 15 lbs., length of blast 7 min., oil feed 4 min., steam 7 min., and at every other run a down-steam run of 2 min. These conditions led to a considerable saving of coal and oil, as compared with Welsh anthracite. The oil used was a gas distillate of 24° B. A similar device had been introduced in the Springer sets; and since it had been put in, there was an entire absence of naphthalene. In connection with water-gas sets, the make of the blower was of some importance. The first one he used made a good deal of carbonic acid at times; but the second one only averaged 3 per cent. The difference was due to the fact that the clearance between the blades and the shell was much smaller in the second than in the first blower. With Mexican coal, the

quantity of carbonic acid could not be reduced so low as with the Welsh, because being larger it afforded better chance for the steam to get through without being decomposed. Dry steam was a great desideratum in water-gas making; so the boiler should be as near to the generator as possible, and it should not have a tendency to prime. He connected the photometer room with the charging floor by telephone, and had a report of the illuminating power sent every half hour. A certain amount of hydrocarbon was deposited in the pipe between the relief holder and the purifiers; and he found this was capable of enriching coal gas. A 12 or 13 candle gas, made from South Prairie coal, would take up all the deposit, and be considerably enriched. In concluding, the author said that after fifteen years' experience he was convinced that constant experiment with different kinds of coal and oil was the only possible method of achieving economy; and that constant watchfulness, hour by hour, was the only way of getting the results they were all anxious to show.

Discussion being invited, Mr. Quilty asked for some information as to the quantity of steam required per 1000 cubic feet of water gas made, and if the pipe under the fire-bars was of cast or wrought iron. Mr. Jones said that the average consumption of fuel for making steam only was 12 lbs. per 1000 cubic feet of gas; and he was not in the position of having any refuse or cheap fuel that could be turned to account for making steam. One difficulty with generators as usually made was the smallness of the outlet pipe, which was usually no larger than the other connections, although the gas at that point was hot and about double the volume it would occupy after cooling. Dr. Powers had adopted the use of shells or limestone mixed with the fuel as a means of reducing the hard clinker. Mr. Lowe said that in small works the consumption of boiler fuel was not so favourable; and the average consumption, in addition to the refuse, screenings, tar, &c., would be equivalent to 20 lbs. of coal. He used limestone or oyster shells for fluxing the clinker. Once a week a layer was charged round the walls; and as it went down, it removed the clinker. The great point was not to use too much, as it was quite possible to melt down the firebrick lining also. Mr. Pederson said that at Marysville, with a make of 25,000 to 30,000 cubic feet per day, the oil used for fuel amounted to $\frac{3}{8}$ gallon per 1000 cubic feet of gas made. He had tried the blast pipe described in the paper, but could not attain the capacity claimed. He thought the explanation was due to the fact that his boilers were overworked, and he got wet steam. Mr. Gregory drew attention to the importance of keeping the stack-pipe clean; and when using a heavy dense coal, he preferred to mix English coke or other light fuel with it. If there was any obstruction, either in the fuel or in the outlet pipe, the blast was not satisfactory. Mr. Osborn remarked that a great deal depended on the accurate working and attention to the heats. On one occasion he had much trouble which was traced to the fact that the operator was colour blind, and not able to distinguish different degrees of temperature. Mr. Holberton suggested that where there was no refuse fuel for raising steam, it might be worth while to consider the advisability of adopting gas-engines. The President said that with Welsh coal a certain quantity of slack and screenings, due to exposure to the weather, accumulated. There were also coke screenings and ashes, and a proportion of water-gas tar that would not sell. All this could be utilized for raising steam. He found the fuel average to be about 14 lbs.; but Mexican coal left very little residue. The divided blast did not do away with clinkering, but increased the capacity of the machines 50 per cent.—viz., from 28,000 to 42,000 cubic feet per hour. It secured an even fire, and eliminated naphthalene. The author's statement that success was a matter of undivided attention on the part of the gas maker sized up the whole question. In one case, after several years' experience, a workman was able to judge accurately, by the sound of the blast, when the moment for closing the stack-valve had arrived.

Mr. L. P. Lowe read a paper on the "Practical Testing of Oil for Gas or Fuel Purposes." He said that, in any undertaking, a comprehensive knowledge of the quality of the materials used was most important, and on the Pacific Coast no subject was more so than that of a suitable oil supply. In Eastern localities, there was only the natural crude oil and a distillate known as "gas oil" available—both well suited for gas manufacture. On the Pacific Coast, however, there were several qualities; and it was impossible to imagine a substance that could be more refractory or difficult of manipulation than some of the Californian crude oils. But these were very valuable, as they served to check and regulate the cost of the coal. The majority of the Californian crude oils contained a considerable proportion of asphaltum, and were exceedingly heavy. They were apt to contain an appreciable proportion of water and dirt. Oils as heavy as 12° to 16° B. would contain several points per cent. of water without attracting notice in casual observation, as it does not readily sink, but remains in minute drops suspended in the body of the oil, thus easily escaping detection. This frequently happened with much lighter oils. Some dealers stored their crude oil in large tanks for a considerable time, and guaranteed the oils to contain not more than 1 per cent. of foreign matter. This degree of purity was not always attained; but the purchaser could deduct for impurities in excess of the guarantee. Dealers who did not use such tanks were willing to guarantee and allow for impurities, and did not charge so much for the oil. It was important to have a practical ready means of determining the physical impurity of oils; and for general purposes a knowledge of the gravity of oils, and of the physical impurities, was sufficient. Crude oils were usually assumed to consist of 85 parts of carbon to 15 of hydrogen, or probably 84 parts of carbon, 14 of hydrogen and 2 of oxygen would be more correct; and in theoretical calculations of the evaporative efficiency, these figures were used, in the absence of any definite analytical data. The author had not been able to get a reliable analysis of the Californian oils, and was not aware of their exact composition; but he would expect the heavier oils to contain rather more carbon. The distillation test had little or no relation with the ultimate analysis, and was specially valuable to the oil refiners rather than to fuel users; while the gas maker could derive much practical information from a distillation test, as to the ease with which the oil could be gasified, and the amount of residuum or tar that might be expected. Californian oils were of the kind known as having an asphaltum base—that is, the residue after distilling off the lighter oils, was of an asphaltic nature; and it was principally the varying proportion of this residuum that made the difference in the gravity. While the light oils were the best for enriching, the heaviest were also successfully used in the manufacture of illuminating gas. While it would be more sensible to designate oils by their actual specific gravity as compared with water, the usual test was an arbitrary one, known as Beaumé's scale, beginning with liquids lighter than water, which read as being 10° on that scale. If the temperature at the time of using the Beaumé hydrometer was more or less than 60°, a correction was made of 1° for every 10° difference in temperature. A very convenient form of hydrometer was one with a thermometer and temperature correction scale attached; and in any case the hydrometer should be standardized or guaranteed. In testing light oils, the instrument would soon settle. But with very heavy oils, some time was required to allow of the instrument settling into its proper position; and it might be questioned whether the gravity of thick or viscuous oils was accurately indicated by the hydrometer. Sometimes a thick oil might be heated until sufficiently fluid for a hydrometer test, and a correction made for temperature; another plan was to dilute the heavy sample with a known proportion of light oil. A test could also be made by floating a drop of the oil in test mixtures of alcohol and water of various strengths; but the proper scientific procedure was to weigh a known volume on a sensitive balance. A simple and efficacious method of determining the presence of physical impurities consisted of mixing equal volumes of the sample and gasoline in a cylinder graduated in hundredths or two-hundredths. Pour in exactly 50 measures of gasoline, make up to the 100 with the sample, thoroughly mix, and allow to stand twenty-four hours, when the water or dirt will have settled to the bottom, and can be directly read off by percentage or volume. A deception sometimes practised by unscrupulous dealers was to mix light oils with residuum in the proper proportion to produce a gravity equal to that of the crude oil; and while such a mixture was a good fuel, it was very indifferent for gas making, and might account for sudden and mysterious differences in results. An addendum to the paper comprised tables showing degrees Beaumé, specific gravity, weight per gallon, and temperature correction.

The President said that the paper did not take upon itself a highly technical character; but it contained a great deal of useful information for gas men who used these oils. Mr. Grimwood said the gasoline test was a good one; but if too much or too light a grade of gasoline was used, there would also be a precipitate of asphaltum, which was not an impurity. Fifty per cent. gasoline was quite safe, unless too light a grade was taken. The chances were, however, that if 84° gasoline was asked for at a drug-store, one would get about 72°. The alcohol test was a convenient way of taking the gravity of an oil; but the water and alcohol must be thoroughly mixed. In purchasing on a gasoline test, the proportion and the gravity to be used should be specified.

Mr. Lowe, in replying, said that gasoline of 80° to 86° was sold with house-lighting machines; but he referred to the ordinary gasoline of 71° to 74°, as generally sold and used for stoves and engines. He had a sample of Los Angeles oil that stood for a year, and at the end of that time contained 19 per cent. of water. The gravity was 12°; and the water was contained in little beads or vesicules, which were broken, and perhaps dissolved, by agitation with gasoline.

Some routine business was disposed of; and the meeting closed with the usual votes of thanks.

Gas-Engines at the New Walthamstow Electricity Works.—Last week (p. 797) we noticed the starting of the new electric supply station of the Walthamstow District Council, and Friday's "Electrician" considers that the Council are to be congratulated on their enterprise in using gas-engines for the driving power in a public electricity supply works. Up to the present, our contemporary remarks, the record of works of this class that have employed gas-driven dynamos has been anything but successful; and every one of them has either changed from the rope-driven gas-dynamo to the direct-coupled steam-dynamo, or has adopted this more conventional machine when making extensions. "The new station, however, is different from the old gas-engine station in the important detail that the dynamos are directly coupled to three-crank vertical gas-engines, which to a casual observer might be mistaken for single-acting vertical steam-engines. District councils should not make experiments; but we may be pardoned if we look forward with interest to the result of this new opportunity for the advocates of gas-engine-driven electricity supply works to prove that this type of station has useful economical possibilities."

REGISTER OF PATENTS.

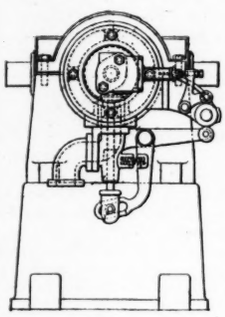
High-Pressure Accumulator for Incandescent Gas Lighting.—Howell, H., of Brixton, S.W. No. 16,780; Sept. 20, 1900.

This invention relates to apparatus for accumulating high pressures in incandescent gas lighting—suitable mainly for optical lantern or for photographic work.

The apparatus consists of two cylinders or tubes (arranged vertically) connected up in such a manner that, when charged with water to a certain height, and gas forced in by a compression pump, the water is displaced in one cylinder and is proportionately forced up into the other one. A ball float is provided, working a device which slows down the motor that drives the compression pump; so that, when the water reaches a predetermined height, the float lifts and causes the device to act, and so reduce the speed of the motor. It also works an escape valve to allow any excess of pressure to pass back to the low-pressure gas-pipe that supplies the compression pump. The apparatus thus works automatically, according to the number of lights in use.

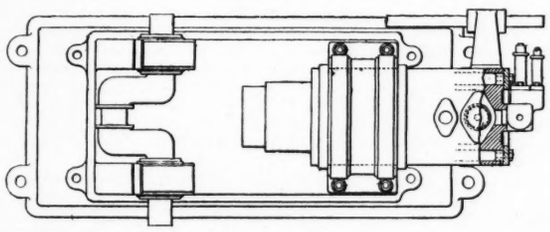
Gas-Engines.—Robinson, O., of Kettering. No. 17,950; Oct. 9, 1900.

According to this invention, the cylinder is not bolted to the bed of the engine as usual, but is carried in a kind of cradle or recess, which permits of the cylinder being readily removed. Also cylinders of different sizes can be used upon the same bed.



The cradle is constructed of brackets carrying a loose cap, which, when the cylinder is placed in position on the bed, is bolted to the brackets so as to secure it in position. In order to afford access to the water-jacket without disturbing the cylinder cover or the combustion chamber fixed to it, or carried by the cover, or which itself practically forms the cylinder cover, the water-jacket is adapted to be closed with an independent ring or cover, which can be readily removed without disturbing any other parts of the engine.

The air and gas valve are each adapted to seat upon one end of a sleeve or



tube provided with an external flange adapted to fit against the end of a casting into which one end of the sleeve screws. The stem of the valve slides in a contracted neck within the sleeve; and the spring for retaining the valve upon its seat is placed around the stem, and inside the sleeve the spring—being confined therein by a cap or collar fixed on to the outer end of the valve stem, and fitting in the outer end of the sleeve so as to form a guide for the stem. The spring at one end bears against the contracted neck, and at the other end against the cap or collar. When the parts are assembled, the spring is thus entirely concealed.

The exhaust-valve is arranged to operate in a casting adapted to be secured to the cylinder, and advantageously formed with a double bend, or of **S** shape; the valve proper being seated in one of the apertures of the double bend, and having its stem extending through a boss or nipple on the side of the casting. The casting is also provided with lugs in which is pivoted a bell-crank lever, one arm of which is designed to be connected with some suitable part of the engine for the purpose of operating it; while the other arm is formed with a cam-slot engaging with a pin or roller fixed to the end of the stem in such a manner that the oscillation of the lever causes the operation of the exhaust-valve. A spring is arranged between the side of the casting and one arm of the bell-crank lever; and this serves, after the valve has been opened, to act upon the bell-crank lever to again bring the valve to its seat.

An end elevation of the engine, with the improvements referred to, is shown; also a plan.

Pellets for Automatically Igniting Gas.—Bleichrode, J., of New York. No. 22,388; Dec. 8, 1900.

These pellets for automatically igniting gas are made by saturating a vegetable fibrous tissue with a solution of chloride of platinum and nitrates of thorium and cerium, and incinerating them. The resulting ash is then mixed with distilled water until it can be moulded and shaped into pellets of a suitable size, which are afterwards subjected to a red heat. Care must be taken, it is remarked, that the solution used should have a high degree of concentration; the weight of the water employed being equal to that of the salts. The proportion of chloride of platinum to nitrate of thorium would be as 1 to 1, and that of nitrate of cerium to each of the two previous compounds as 1 to 10.

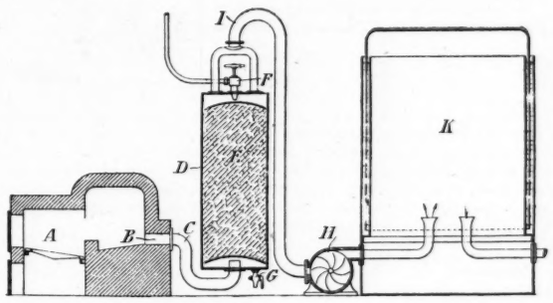
Coin-Prepayment Meters.—Kennedy, R., of Kilmarnock. No. 22,831; Dec. 14, 1900.

These improvements in coin-prepayment mechanism for fluid-meters comprise (in combination) a valve-opening lever centred at one end on a bracket on the framing of the meter and provided near the other end with a hollow cap-piece worked by a pusher-piece through a coin interposed between the inner end of the pusher and the outer edges of the cap. A locking lever is provided with a catch for acting on the supply-valve spindle; a pin or projection being fitted to the side of the lever to be acted on by the shorter arm of a two-armed release lever. The longer arm of the lever is formed at its outer end with a downwardly projecting tapered or cam-shaped toe, arranged to ride on the top of a worm or spur wheel, or on a pair of differential worm or spur wheels working one above the other on a stud. The number and pitch of the teeth on the wheels are slightly different; the wheels being driven by a worm fixed to the meter shaft. A slot or release opening for the lever toe is formed through the wheels; and a downwardly projecting pin is fitted to their underside to work a bell-crank lever or trigger-piece, which acts on the valve-opening lever.

Manufacture of Gas.—D'Altoff, L. T., of Brussels. No. 8905; April 30, 1901.

The object of this invention is "to utilize the combustion gases of furnaces of all kinds for the manufacture of industrial gases—such as illuminating gas, motive-power gas, and the like, merely by the carburation of the combustion gases upon their leaving the furnace."

The method of carrying the invention into practice is "illustrated diagrammatically."



A is the furnace, either of a steam generator or of any other industrial installation, or simply a grate or stove, the outlet-flue B of which is connected, by means of a conduit C, with a carburettor D. This consists of a cylinder containing a porous medium E, which is adapted to serve at the same time as a filtering medium and as a container of hydrocarbons, in the proportion necessary to constitute a "good industrial gas, either for illuminating or combustion purposes." It may be gravel, brick, pumice-stone, or the like; but coke, charcoal, and ligneous substances (peat) will serve the same purpose. In fact, their employment is more advantageous; since, after saturation—that is to say, after their removal from the carburettor—they constitute, the patentee remarks, not only a fuel of great value, but also "one in which a high percentage of the fuel employed in the furnace originally is present, and which is at present absolutely lost and issues from the chimneys as smoke, whereas in this case it is retained integrally in the porous medium, which only permits the volatile portion of the smoke to pass . . . charged with hydrocarbons which are so much the more finely volatilized in that the purified smoke in which they are carried away passes through the carburettor in a hot state." The hydrocarbons are introduced into the carburettor through an adjustable valve F, arranged at the upper portion of the carburettor in communication with a suitable reservoir. Through this valve the hydrocarbons enter and saturate the entire volume of the porous medium until the test-cock G, arranged at the lower portion of the carburettor, indicates that saturation has taken place.

The combustion products pass upwards through the carburettor and its porous medium by means of a forced draught produced by a fan or suction device H, which is connected on the one hand with the carburettor by the branch pipe I leading from the carburettor cover, and, on the other hand, with a gas dome or container K, where the gas passing through the suction device is stored.

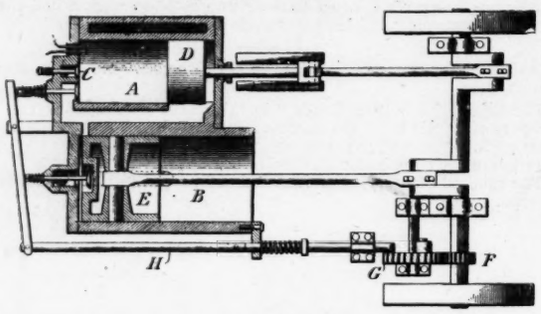
Gas-Engines.—Toedt, F. W., of Hamburg, Io., U.S.A. No. 12,204; June 14, 1901.

This invention relates to compound explosion engines. The object is to provide an engine which is so constructed that, when a charge is exploded in the high-pressure cylinder, it will pass therefrom to a low-pressure one—there acting upon the low-pressure piston to utilize the unexpended force of the charge; the pistons being both connected to opposed cranks on a shaft having means connected thereto for actuating the valves once every two revolutions of the shaft. The construction of the engine is such that the charge, after being exploded in the high-pressure cylinder, drives its piston beyond a port which places this cylinder in communication with a low-pressure one; thus the unexpended power of the charge will drive the low-pressure piston.

In the illustration on p. 846, the position of the pistons is shown as they will be after the charge has been exploded, and before the stroke has been completed.

The high-pressure cylinder A is partially surrounded by a water chamber; and at the side is the low-pressure cylinder B, which is open at one end. The cylinder A has a valved entrance-port C; the stem of the valve passing through the head of the cylinder, and the exit-port through the head of cylinder B. The gas, mixed with air, is drawn into the high-pressure cylinder through the port C; and adjacent to it there are electric igniters of any suitable type. So that, after the explosive charge has been drawn into the cylinder A, and compressed, the charge is ignited to give the first impulse or power stroke to the piston. The piston has a rod attached to it; and connected to its outer end (which operates between slides) is a connecting rod which engages the crank on the main shaft. The piston E of the low-pressure cylinder is pivotally attached to a connecting rod, which also engages another crank on the shaft with a longer throw than the other crank. The shaft has keyed on it a pinion F, which engages a gear-wheel G (mounted on a

suitable shaft) twice the diameter of the pinion F; so that it will make two complete revolutions to one of the gear-wheel. A rod H has one end in the path of the cam on the pinion F; and jointed to the rod is a lever for engagement with the stems of the valves of the ports of the cylinder. These stems are provided with springs, which draw the valves over the ports when they are not moved therefrom by the lever. The inlet-port C, through the head of the high-pressure cylinder, is held closed by a spring retracted valve, the stem of which passes through a chamber to which the inlet-pipe for the explosive mixture or gas is attached.



By the construction shown, the high and low pressure cylinders are first of all placed in communication at the end of the power stroke Before the pistons start on their second movement, the lever attached to the rod H is operated, and opens the lower port in the cylinder A and closes the exit-port. The valves of these ports are thus actuated at the commencement of the second impulse of the pistons, after which they are restored to their normal or initial position.

Gas-Producers.—Taylor, M., of Paris. No. 14,100; July 10, 1901.

This invention refers more especially to gas-producers like those described in patent No. 1574 of 1899. The improvement consists in the closing arrangement for the upper part of the producer permitting of the producer being charged when at work, while excluding air and preventing the escape of gases at the charging hopper; and also in improvements in connection with the gas outlet, whereby the gases cannot pass through the charge of fresh fuel, and are thus prevented from carrying off particles of the fuel while the resistance of the exit to the gases is reduced.

APPLICATIONS FOR LETTERS PATENT.

17,968.—Tavernor, J. M., and Wheatcroft, H., "Generating acetylene gas." Sept. 9.

17,975.—O'Brien, J. O., "Acetylene lamps and generators." A communication from M. Wagner. Sept. 9.

17,995-6.—Hunt, C. W., "Conveyors." Sept. 9.

18,002.—Busse, W., "Self-lighters for gas-burners." Sept. 9.

18,012.—Marks, G. C., "Burners for incandescent gas lighting." Sept. 9.

18,065.—Blakey, J. W., "Anti-vibration devices for incandescent burners." Sept. 10.

18,093.—Thiersant, H. de, "Electric gas-lighters." A communication from La Société Radiguet et Massiot. Sept. 10.

18,101.—Hartridge, W. B., "A combined gas and fuel stove." Sept. 10.

18,116.—Law, J. W., "Incandescent burners." Sept. 11.

18,148.—Laird, D., "Retort-furnace." Sept. 11.

18,159.—Koppers, H., "Preventing the leakage of gases through the walls of coke-ovens, retorts, &c." Sept. 11.

18,172.—Rothstein, I., "Incandescent mantles." Sept. 11.

18,174.—Olai, F., and Brown, C. "Carburettors." Sept. 11.

18,207.—Fletcher, T., Neil, J., and Fletcher, Russell, and Co., Ltd., "Fire-brick back for iron fret fires." Sept. 12.

18,247.—Koenig, F., "Incandescent gas-lamps." Sept. 12.

18,260.—Kappel, W., "Bunsen burners." Sept. 12.

18,262.—Morrell, R. L., and Leigh-Hunt, W., "Regulators for controlling gases." Sept. 12.

18,282.—Cooke, H., "Gas-fittings and the like." Sept. 13.

18,285.—Anderson, A., "Acetylene gas generators." Sept. 13.

18,352.—Barnett, B., "Gas-brackets and the like." Sept. 13.

18,354.—Lanchester, F. W., "Internal combustion engines." Sept. 13.

18,402.—Wilson, L., "Gas-engines." Sept. 14.

18,438.—Kitson, A., "Illuminating apparatus." Sept. 14.

23,044A.—Naef, P., "Gas-producers." Sept. 17.

18,503.—Sardy, J. L., "Chimneys of gas-burners." A communication from the North Carolina Mica Company. Sept. 16.

18,513.—Ruppert, O., "Manufacture of illuminating gas and coke." Sept. 16.

18,520.—Melhuish, A. G., and Beaumont, F. J., "Gas heating apparatus." Sept. 16.

18,558.—Migeot Bros. and Lepouse, J., "Generation of acetylene." Sept. 17.

18,672.—Hartridge, W. B., "Combined gas and fuel stove." Sept. 18.

18,675.—Key, W., "Ventilating and illuminating buildings." Sept. 18.

18,683.—Harvey, W. H., "Gas-burners." Sept. 19.

18,749.—Naef, P., "Treatment of materials with liquids and gases." Sept. 19.

18,827.—Mackenzie, J. W., "Acetylene gas-burners." A communication from J. J. Graf. Sept. 20.

18,832.—Piers, E. F., "Gas-engines." Sept 20.

18,841.—Johnston, J., and Dobbs, A. E., "Burner and like regulator." Sept. 20.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Mr. Herring's Engineering Congress (Gas Section) Paper.

Sir,—I shall be glad if you will insert the enclosed at the conclusion of my reply on the discussion of the "Inclined Retort" paper.

W. R. Herring.

Edinburgh, Sept. 23, 1901.

[Enclosure.]

Rate of Wages, per 1000 *Cubic Feet of Gas Sold, when Manufactured in Inclined Retorts, as Compared with the Earlier Periods when Manufactured in Horizontal Retorts.*

	Brentford. 20-feet Retorts.	Huddersfield. 15-feet Retorts.
1892	4·56 pence	4·12 pence.
1893	4·33 ,,	4·12 ,,
1894	4·19 ,,	4·04 ,,
1895	3·12 ,,	3·65 ,,
1896	2·64 ,,	2·72 ,,
1897	2·51 ,,	2·83 ,,
1898	2·38 ,,	2·36 ,,
1899	2·33 ,,	2·33 ,,
1900	2·17 ,,	2·50 ,,

[Mr. Herring's figures did not, unfortunately, come to hand last week in time for them to appear with the report of the discussion on his paper.—Ed. J. G. L.].

The New Gasholder at Amsterdam.

Sir,—In answer to Mr. F. S. Cripps's letter in the last number of the "Journal," I beg to state that I only said in my paper that the tank of the proposed gasholder for Amsterdam, with regard to the size and special conditions of soil, is a novelty; and this opinion is not in the least shaken by what your correspondent remarks.

I know, of course, as well as he, that the principle of forming a store-room underneath a holder is old; and I have seen a good many of these gasholders myself. Looking at the meagre description of the patent No. 4027 granted to Mr. W. T. Walker, I do not see that it proposed to load the roof of the intervening central space of the tank with a large quantity of water, so as to transmit through this water an outward thrust to the vertical stays of the inner mantle, and to be able to make a lighter construction possible. I see, on the contrary, that there is spoken of a small depth of water, only for the purpose of sealing. It also shows a centre pier. The Amsterdam holder is thus different; and I repeat that, as far as I know, a holder of this size and kind has never been erected yet.

I take this opportunity to express to the author of the splendid standard work on guide-framing of gasholders my gratitude for his kind judgment of my poor paper. He may be convinced that a great many Continental gas engineers are very much indebted to him, and earnestly study his book. I regret that I had not the honour of making his acquaintance in Glasgow.

I am sorry to see Mr. Cripps complains of the scale of the reproduction of the diagrams. I have asked Mr. Helps to send him the diagrams which were exhibited during the reading of my paper in Glasgow. They are on double the scale of the original ones.

J. van Rossum du Chattel.

Amsterdam, Sept. 28, 1901.

"Modern Appliances in Gas Manufacture."

Sir,—Permit me to say that the articles forming the first two chapters of this book were contributed to "Feilden's Magazine" by my late brother, Mr. G. E. Stevenson, and that the articles forming the remaining chapters only were from my pen.

It was not with my knowledge or desire that my brother's name was omitted as joint author with myself; and I would therefore feel obliged if you would insert this letter in the "Journal," so that any wrong impression may be corrected.

Fletcher W. Stevenson.

Palace Chambers, S.W., Sept. 24, 1901.

Mr. Porter's Paper on "British Water-Gas Practice," at the last Gas Institute Meeting.

Sir,—The letter from the pen of Mr. David Terrace *re* the above, which appeared in your last issue, is one which, to the majority of minds, will convey its own answer. I need scarcely reiterate the offer I made to Mr. Terrace, upon his pointing out that the item in question included a quantity of coke used for purposes other than the manufacture of water gas—viz., that if he would furnish me with the weight of coke used in the coal-gas boilers, I would have the matter corrected before the appearance of the "Transactions." But for some inscrutable reason, he declines to furnish me with this most necessary figure. To call for a correction, and at the same time to withhold the corrective factor, is, I submit, most unreasonable; and it fully accounts for any delay on my part. Indeed, it renders correction impossible until such time as the missing link is forthcoming.

To take cover under the wording of the heading of column 17 in the "Returns of Gas Undertakings of Local Authorities" is assuredly begging the question. Let me point out that there is also another column recently added—viz., No. 20, which refers to the quantity of water gas supplied, and the maximum proportion of water gas to coal gas at any one time. These two columns, which were introduced into the returns as recently as 1897, must, I contend, be taken in conjunction; and when one observes that the returns from any undertaking include a quantity of crude petroleum, and of coke used for gas-making purposes (in column 17), and a given quantity of water gas as being supplied (in column 20), I venture to think that 99 per cent. of gas engineers would conclude at once that these materials had been used in

the manufacture of water gas, and in as large a proportion of cases such a conclusion would be perfectly correct.

To be at all consistent, Mr. Terrace should, as I have already pointed out to him, include coke used in the retort-furnaces, exactly as he has included coal gas boiler fuel; also any coke that had been used for any purpose connected with the manufacture of gas. But such was clearly not the intention of those responsible for the introduction of columns 17 and 20 in the returns. These columns were undoubtedly inserted to provide, chiefly, a means of ascertaining the quantity and proportion of water gas being sent out with the materials used in its production, and incidentally a record of the materials used in the various forms of enrichment now in use. A reference to my Statement A will show that in no instance, has the item "other materials used in the manufacture of gas" been noticed unless the accompanying column 20 furnishes the quantity of water gas made.

The most startling portion of Mr. Terrace's confession, however, is his assertion that, although present at the reading and discussion of my paper, he did not realize that he—a manufacturer of water gas—was responsible for the abnormal item in my Statement B. To fail to recognize one's own production—particularly when it is endowed with such striking characteristics—betrays a lack of familiarity, or degree of indifference, seldom met with in regard to such a burning question.

Allow me to indicate that, in the course of my paper, I deplored the incompleteness of the water gas returns—more especially in regard to coke used; yet such as they were (through no fault of mine, but rather of those formulating them), I tabulated them, and worked from the basis thus provided for me.

In conclusion, permit me to once more request Mr. Terrace to state, through the medium of your columns, the quantity of coke used in his coal-gas boilers during the year in question; and I shall then be in a position to make the necessary correction—not only in Mr. Terrace's individual case, but in the average of my Statement B—with all the publicity he may desire.

Elland, Sept. 27, 1901. ROBERT PORTER.

LEGAL INTELLIGENCE.

A Tar Contract.

The Cupar Gas Company, Limited, have lodged with the Sheriff-Clerk a petition against Messrs. W. Briggs and Sons, Limited, of Dundee and Ladybank, praying the Court to grant a warrant to them to sell, publicly or privately, the tar and ammoniacal liquor made and to be made by them during the year ending July 21, 1902, so far as the defendants have not taken delivery. It appears that, on or about May 8 last, the defendants offered to purchase the tar and ammoniacal liquor at 2s. 1d. per ton of coal carbonized. The Company accepted the tender, and certain conditions were agreed upon. In terms of the contract, the defendants have, it is stated, taken a small quantity of the products, but have now refused to give effect to the contract or take further delivery. An action for damages for breach of contract is pending. In consequence of defendants' failure to take the products, the Company's tanks are full, and they have no other means of storing the tar and liquor which is being daily produced. In consequence of this, the Company request that the proceedings be dealt with summarily. In their defence, Messrs. Briggs deny that they refuse to give effect to the contract or take further delivery. They assert that the Company have failed in their contract for the past year in so far as they have only produced 29½ gallons of tar and ammoniacal liquor per ton of coal carbonized; while they are bound to produce and deliver the normal quantity of tar and liquor per ton of coal, which is 50 gallons per ton. The defendants allege an implied warranty to this effect; and in terms of section 53 of the Sale of Foods Act, claim to set up against the Company a breach of warranty in diminution of the price. Defendants state that their tank-waggons are frequently lying at Cupar ready to receive the tar and liquor; and they maintain that, as they are ready and willing to take delivery of the products, the present proceedings are unnecessary, and should be dismissed.

Withdrawal of the Claim for Damages for the Destruction of the Cork Gasholder.

The Recorder of Cork (Sir J. C. Neligan) had the claim of the Cork Consumers' Gas Company in connection with the destruction of their gasholder and store brought before him, at the Borough Sessions, yesterday week. Mr. Arthur Julian, appearing for the Company, said his Honour would not be troubled with the application. The Company put in a claim for the sum of £3278 for the destruction of the holder and store on June 3, after a strike of the gas stokers. Owing, under the circumstances, to the very large amount of the claim, and seeing that the citizens were very much interested in it, the Directors thought it only right to get the highest possible expert opinion; and they brought over two of the best known expert gas engineers. They had inspected the works, and reported that the injury might have been an accident or maliciously caused. The Directors carefully considered this report, and came to the conclusion that they would not be justified in further prosecuting the claim. Accordingly on Sept. 12 they served notice of withdrawal. The notice of claim having been served, on the 8th of June Mr. M'Carthy, for the Borough Council, applied for a dismissal of the case; and after considerable argument, his Honour said, in his opinion, the three parties—the Borough Council, Rural District Council, and the County Council—were entitled to the costs properly and necessarily incurred up to the reception of the notice of withdrawal on Sept. 12. He accordingly declared the case dismissed, with costs.

Leaving a Gas Company's Service without Warning.

Sheriff-Substitute Baillie, of Hawick, was called upon a few days since to adjudicate in a case in which William Cummings and John Oliver sued the Hawick Gas Company for 6s. 8d. each, being two days' wages deducted owing to the men having left service without giving a fortnight's warning, as required by the rules. The Company lodged a counterclaim for 10s. against each of the men; as damages for desertion of service. Mr. Joseph Smith, the Manager, stated that printed rules, in which the requirement as to a fortnight's notice was mentioned, were exposed in a prominent place in the works. The reason the men left was because they wanted more pay for their ordinary work. Mr. W. Smith asserted that, when he engaged the men, he informed them that they would have to give a fortnight's notice before leaving. The men denied this, and declared that the rules in the retort-house were illegible. The Sheriff was satisfied with the evidence tendered on behalf of the Company. The men, he said, had broken the rules, and so had forfeited their wages. He acquitted the Company, and dismissed the counterclaim.

Illegal Use of Water at Lancaster.

The Lancaster Corporation seem to be taking stern measures to suppress the wrongful use of water. Within a week, two cases have been before the local Bench. In the first, John Wilson was the delinquent. He has a garden adjoining one in the possession of a Mr. Atkinson, who has a standpipe and hose in it, for which he pays. When no one was about, defendant could not resist his neighbour's simple method of watering; and the hose accordingly found its way over the fence dividing the gardens. Twice he had been caught; and the second time he has had to pay 20s. fine and costs. Roger Hargreaves appeared as the defendant in a case two days later. He is a nurseryman, and owns gardens at Slyne. Boys in his employ were found conveying water in barrels to the gardens from the house of defendant's foreman. The penalty imposed was 40s. and costs.

Responsibility for Gas Supplied to a Club.

At last Wednesday's Matlock Petty Sessions, the Matlock Gas Company sued the Committee of the defunct Matlock Union Social Club, for £6 odd for gas supplied. The point at issue was whether the members of the Committee were liable for the debts of the club. The plaintiffs held that they were. A number of the defendants went into the box and swore they knew nothing of the affairs of the club. One had nothing to do with it because it was irregular, and kept open all night sometimes; another had not paid his subscription. But the Bench made all responsible for the debt, and ordered it to be shared between eleven members of the Committee.

Imprisonment for Embezzlement.

Thomas J. Casey was until lately a collector in the employ of the Alliance and Dublin Consumers' Gas Company; and twice within the last fortnight he has appeared at the Northern Police Court, Dublin, to answer the charge of having embezzled various sums of money received by him on behalf of his employers. Defendant's duty was to collect meter-rents; and during June, July, and August, he failed to hand over to the Company several sums of money which were paid to him by consumers. Those mentioned in the case ranged in amount from a few shillings to £1 16s. 8d. The defendant gave unofficial receipts for the money. He pleaded guilty, and was sentenced to two months' imprisonment, with hard labour.

Leamington Priors Gas Company.—The half-yearly meeting of this Company was held last Tuesday—Mr. Edward Wright presiding. The Chairman stated that the Company had had a fairly successful half year; being able to pay the full dividends, and leave a small balance of about £100 in hand. Dividends were declared at the rate of 10 per cent. per annum on the "A" shares and 7 per cent. on the "B" shares.

West Gloucestershire Water Company.—It is stated in the report of this Company for the half year to Aug. 31 that 270 additional services have been laid on, making the number of houses and other properties supplied at that date 8025, which, together with some meter and miscellaneous supplies, are estimated to produce a water-rental of £7669 per annum. This is an increase of £209 during the past six months. To this total must be added about £200 for rent of property, &c., making a total estimated annual income of £7869. The accounts for the half year show that, after paying all working expenses and interest on debenture stock, there has been a net profit earned of £2276, which, together with the £54 brought forward from the last balance-sheet, makes a total of £2331 to the credit of the revenue account. The Directors recommend the declaration of a dividend at the rate of 4 per cent. per annum upon the shares under the Act of 1884, and £2 16s. per cent. upon the shares under the Acts of 1887 and 1899, both less income-tax. This will absorb the sum of £2313, leaving a balance of £18 to be carried forward. The rate of dividend has been steadily maintained during the past three years, though in the meantime the share capital issued has increased by £50,000,

Aldeburgh Water-Works Purchase.—The Aldeburgh Town Council at their meeting last Friday transacted the most important business that has come under consideration since their new charter was obtained. They took, in short, the final step in the preliminary proceedings connected with the procuring of a new water supply for the town. The report upon which discussion took place stated that, inasmuch as the transfer day fell on Sept. 29, and it had not yet been possible to ascertain the parliamentary expenses and to negotiate a loan under the Act, an arrangement had been made with the Bank for an overdraft for the consideration money of £5000 to be paid to the Water Company upon the completion of the purchase, less the principal money of £1200 owing by the Company to the Corporation on mortgage, which, under the Act, the Corporation were entitled to retain, together with any unpaid interest. Negotiations, it was also stated, had been opened with the owner and lessee of a piece of land shown on a plan prepared by Mr. James Mansergh (who is advising the Council) on which it was proposed to construct additional water-works. The Council adopted the report; the Mayor and Alderman Flintham being complimented on the expeditious manner in which, through their assistance, the purchase of the water-works had been carried through.

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Report and Accounts.

The accounts presented at the Meeting of the Company yesterday, showed that the total revenue for the half year ended the 30th of June last amounted to £158,983. The expenditure for the same period, including interest on loan capital, &c., was £125,524, leaving a net profit on the six months' working of £33,459. To this had to be added the sum of £8282 carried forward from previous accounts, making the total at the credit of the profit and loss account £41,741. The revenue from the sale of gas to private consumers (603,296,400 cubic feet) amounted to £111,386, and from public lighting to £7660. Meter rents realized £12,220; and for residuals £27,269 was received. Manufacture of gas cost £91,351; distribution, £12,056; and management, £4870. There were 44,078 tons of coal, 2069 tons of cannel, and 281 tons of oil (1,059,958 gallons being used for enrichment and the manufacture of oil gas) employed in the production of 729,407,000 cubic feet of gas, of which 646,455,000 cubic feet were sold, and 653,736,000 cubic feet accounted for. The estimated quantities of residuals made were: Coke, 60,757 chaldrons; breeze, 9503 chaldrons; tar, 755,429 gallons; and ammoniacal liquor, 1,038,280 gallons. The Directors recommended the payment of the usual dividends at the rate of 10½ and 7½ per cent. per annum on the respective shares. Reference was made in the report to the death of Mr. Thomas Brunker, who for many years acted as one of the Shareholders' Auditors.

BRITISH GASLIGHT COMPANY, LIMITED.

The Official Changes.

The Half-Yearly Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting, and also the Directors' report. The latter stated that the available profit was £23,892, after making the necessary deductions, and adding £9249 from the Hull reserve fund, £454 from the Potteries reserve fund, and £573 from the Trowbridge reserve fund—the parliamentary interest at the stations not having been realized by these respective amounts. The deductions were as follows: Income-tax, £1446; Hull debenture interest, £993; Norwich debenture interest, £898; Potteries debenture interest, £378; and Trowbridge debenture interest, £165—total, £3881. Respecting the Hull station, the gas-rental showed an increase of £5897, as compared with the corresponding period of 1900; the price of gas having been increased from 1s. 10d. to 2s. per 1000 cubic feet from the 1st of July, 1900. Coke exhibited a decrease of £2715; tar and tar distilling, a decrease of £1513; and ammoniacal liquor and sulphate, a decrease of £238. Coal cost 16s. 7d. per ton, against 12s. 6d. per ton; and coke realized 13s. 8d. per ton, as against 13s. 9d. per ton. The gas sent out was 521,979,812 cubic feet, compared with 501,435,298 cubic feet, or an increase of 20,544,514 cubic feet, equal to 4·09 per cent. Of this quantity, 50,730,000 cubic feet was delivered in bulk to the Corporation for the supply of the Old Town. The profit realized was £9249 less than the parliamentary interest. This sum had been taken from the reserve fund; leaving a balance of £30,966. In regard to Norwich, the gas-rental showed an increase of £5749, as compared with that of the corresponding period of 1900; the price of gas having been increased from 3s. to 3s. 6d. per 1000 cubic feet from the 1st of July, 1900. Coke showed an increase of £222; and tar and ammoniacal liquor a decrease of £287. Coal cost 22s. 4d. per ton, as against 19s. 5d. per ton; and coke realized 12s. per chaldron, as against 12s. 7d. per chaldron. The gas sent out was 191,480,000 cubic feet, as compared with 185,516,000 cubic feet, or an increase of 5,964,000 cubic feet, equal to 3·21 per cent. The profit realized was £3083 less than the parliamentary interest. As to the Potteries station, the gas-rental showed an increase of £3068; the price of gas having been increased from 2s. 3d. to 2s. 8d. per 1000 cubic feet from the 1st of July, 1900. Coke showed an increase of £1829; and tar, ammoniacal liquor, and sulphate, a decrease of £155. Coal cost 15s. 11d. per ton, against 11s. 7d. per ton; and coke realized 12s. 1d. per ton, against 7s. 10d. per ton. The gas sent out was 184,577,000 cubic feet, against 183,616,000 cubic feet, or an increase of 961,000 cubic feet, equal to 0·52 per cent. The profit realized was £454 less than the parliamentary interest. This sum had been taken from the reserve fund, leaving a balance of £19,600. At Trowbridge, the gas-rental showed an increase of £402; the price of gas having been increased from 3s. 2d. to 3s. 6d. per 1000 cubic feet from the 1st of July, 1900—the discounts remaining the same. The residual products realized £438 more. Coal cost 19s. 4d. per ton, against 15s. 6d. per ton; and coke realized 15s. 2d. per ton, as against 14s. 11d. per ton. The gas sent out was 28,130,800 cubic feet, as against 27,928,053 cubic feet—an increase of 202,747 cubic feet, equal to 0 72 per cent. The profit realized was £573 less than the parliamentary interest. This sum had been taken from the reserve fund, leaving a balance of £1502. Regarding Holywell, the gas rental showed a slight increase. The residual products realized about the same. The profit was £238. Summing up the accounts, the Directors stated that the available profit, added to the previous balance of profit and loss, amounted to £52,316. From this, the Directors recommended a dividend at the rate of 10 per cent. per annum, clear of income-tax. This would amount to £23,000, and leave a balance of £29,316.

The CHAIRMAN then moved the adoption of the report and accounts. In doing so, he said the observations he had to make on this occasion might take rather longer than those he had had to offer at previous meetings, because there were a good many points of interest to which he would have to refer. First of all, with regard to the accounts for the half year to June 30. There was a balance available for dividend of £23,892; and this compared with £22,370 in the corresponding period of 1900. That was to say, they were this time about £1500 to the good, after deducting the increased income-tax, which amounted to £400—the total of which for the half year was £1446; and this, of course, was equivalent to a bonus to the shareholders. Respecting the powers given to the Board by the shareholders, in March last, to issue debenture stock for the purposes of the business, the Directors raised £60,000. It was offered, in the first instance, to the shareholders, who, he supposed, saw the advantages of the situation, and applied for £52,000. The small balance was eagerly taken up by outside friends—not shareholders—at a moderate premium; so that it was evident the credit of the Company was in very good case, and their 4 per cent. debenture stock looked upon as a very safe and reliable security. In the accounts, it would be noticed that the Directors had had to draw considerably from the reserve fund at Hull, and also in a smaller degree from the reserve funds of the Potteries and Trowbridge stations, to make up what was described as the deficiencies of profit at these stations. The drawing of so large a sum as £9249 from the Hull reserve fund did not in any way frighten the Directors, because, in arranging the business at Hull, they only put up the price of gas to the consumers by 2d. per 1000 cubic feet, knowing full well that at least 4d. or 5d. would be required, if they were not to draw anything from the reserve fund. They had at that station, with the full consent of Parliament, a large reserve fund amounting to nearly £40,000; and he maintained—and he believed his fellow Directors were entirely with him on this point—that this reserve fund was created purely to meet the exigencies of such a situation as was occasioned by a very high price of coal (which only occurred at very long intervals), so that the Company need not raise the price of gas to the consumers unduly. In this respect, they had certainly met the consumers fairly; and at the same time they had not in any way defrauded the shareholders. He merely alluded to this because it was the policy upon which the Board always tried to act. Turning to the different stations, he remarked that, when the shareholders last met, the differences with the Corporation of Hull regarding the Bill which the Company then had in Parliament had not been settled. However, shortly after the shareholders' meeting in March, the Directors came to a very amicable settlement with the Corporation, by which he thought the Company were very well protected. They got, practically speaking, what they wanted, with some slight giving way; and he hoped they would now have a quiet and easy time at Hull for a long period. On the last occasion, he prophesied that the falling off in the consumption of gas at Hull would soon be met by the usual increase. He was sorry he made that prophecy, because prophecies by gas directors did not very often turn out as they ought to do. (Laughter.) There was no doubt about it that Hull was at the present moment suffering considerably from bad trade; and the result was that the Gas Company were almost the first to feel it. The consequence was they had had a slight reduction in the consumption—that was to say, taking away from the total quantity of gas sold the large amount they had to supply to the Corporation for the Kingston-upon-Hull district, and then comparing the gas sold with that sold before they entered into that contract, the consumption showed a reduction equal to 1¾ per cent. There was, however, nothing very serious about this; and the Directors hoped to pick it up again soon. There was another matter in connection with Hull which would be of interest to the shareholders—that was, the resignation of their very able Engineer and Manager (Mr. Andrew Dougall). He came to the Company from Kidderminster, and was appointed their Chief Engineer 27 years ago, when Hull was beginning to extend; and he had had, during those 27 years, some very heavy work indeed, which he (the Chairman) was sorry to say, had told upon his health in great measure. It was felt by Mr. Dougall, and it was felt by the Board, that the time had come when he should seek for some ease and leisure; and so the Directors accepted his resignation. They had, he trusted, given Mr. Dougall what he deserved in every sense of the word—a good pension; and he hoped that he would live long to enjoy it. His place had been filled by the appointment of Mr. John Young, of Norwich. He was a gentleman who had been in the Company's service a good many years, and had shown unbounded energy. He was a splendid Engineer; and he (the Chairman) had every confidence that the Hull station would be carried on with his engineering knowledge in the best possible manner. Of course, the transition of Mr. Young from Norwich to Hull left the former station without an Engineer; and as there was no one whom the Directors thought fit to move there from the Company's other stations, they advertised for an Engineer. The result was that, out of the many applications received, they had appointed Mr. Thomas Glover, of West Bromwich, who would take up his duties next month, and whom, he hoped and sincerely trusted, would prove himself an efficient Engineer in the service of the Company. In his last address to the shareholders, he (the Chairman) stated that at the Potteries they had a large tank and gasholder in course of construction. He was glad to say great progress had been made with the work. It would be finished by the middle of October, and would be in action in good time for the winter's work. They had also the opportunity of buying for Tunstall a new office, which was wanted very badly. As the Manchester and Liverpool District Bank were moving their offices, the Directors took the opportunity of purchasing their old place, where they would be able to extend the Company's show-rooms, and enlarge the business of the Tunstall district in consequence. At Trowbridge, following up the remarks he made at the last meeting, nearly the whole of the remodelling of the works there was completed during the half year. They finished a boiler-house, sulphate plant, men's mess-room (which was urgently required), and put in more regenerative furnaces for the coming winter's work. They had now at Trowbridge an up-to-date and model little station. His remarks had been somewhat longer than usual; but he hoped they had been interesting.

Colonel J. WILKINSON seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. F. WILKIN, a dividend of 20s. per share for the half year was declared, clear of income-tax.

Moved by Colonel WILKINSON, and seconded by Mr. R. S. GARDINER, Mr. Corbet Woodall was re-elected to his seat at the Board.

Mr. WOODALL, having thanked the shareholders and replied to some highly complimentary remarks that fell from Colonel Wilkinson, proposed the re-election to the Board of Mr. Gardiner.

General CORRIE seconded the motion, which was also unanimously agreed to.

The Auditors (Mr. Edward Yardley and Mr. E. Knowles Corrie) having been re-appointed,

Mr. B. F. HARRIS moved, and Mr. E. K. CORRIE seconded, a vote of thanks to the Chairman and Directors for their diligent services during the half year.

The motion having been passed,

The CHAIRMAN responded; and then proposed that a similar compliment be paid to the Secretary and officers of the Company. He remarked that they had had a good many changes of late, and more changes might come in the future. However, they were ably served by their Secretary and the staff in the country; and he hoped the thanks of the meeting would be heartily accorded.

Colonel WILKINSON seconded the proposition; and it was cordially agreed to.

The response of the SECRETARY, on behalf of the officials, ended the proceedings.

SHREWSBURY GAS COMPANY.

The Ordinary General Meeting of this Company was held at the Offices, Shrewsbury, last Wednesday—Mr. W. BEACALL, the Deputy-Chairman, presiding.

The report stated that the profit on the year's working to June 30 amounted to £5467, out of which an interim dividend was paid in March. The Directors recommended that the authorized dividend be declared, after providing for which, and for interest on mortgages, there would be a balance to carry forward of £630. There had been a decrease of 2·71 per cent. in the consumption of gas during the year, due to the mildness of the winter and the increased price. The unaccounted-for gas had further decreased to 7·05 per cent. Coal contracts having been concluded on more favourable terms, though still considerably above normal prices, the Directors had been enabled to make a reduction of 4d. per 1000 cubic feet in the price of gas as from June 30. They had, however, to face a heavy fall in the value of coke. The Company's Bill, which received the Royal Assent on July 2, had passed unopposed through Parliament; an agreement having been made with the Corporation for the insertion of clauses to provide a sliding-scale price of gas and dividends, and for permissive power to promote a Bill for the purchase of the undertaking. During the year, 369 slot meters had been fixed, and 400 cooking and heating stoves let on hire. This department showed every sign of continued prosperity.

The CHAIRMAN, in moving the adoption of the report, said that the past year had been an eventful one for the Company. The obtaining of a new Act itself marked a definite stage in their existence; and the adoption of the principle of a sliding-scale more closely identified than before the interests of consumers and shareholders. The Company's continued prosperity was evidenced by the capital expenditure required during the year for extensions of works and plant. This amounted to £5082, leaving the capital account overdrawn on June 30 by £3240. For this latter sum, for working capital, and for forthcoming necessary expenditure, the Directors intended to provide by selling by auction £5000 worth of the stock authorized by the Company's new Act. This would rank in all respects equal to the existing stock. The Directors also intended to obtain £11,000 on mortgage, for which they were open to receive offers. On the revenue account, the item dominating all the rest was coal, which cost them £3477 more than it did the year before. This serious increase of expenditure was met mainly by an advance in the price of gas, which the Board were compelled to make, and partly by the very satisfactory price of coke during the year. The outcome of the whole was that the profits amounted to £191 more than last year; and after paying the usual dividends and interest on loans, they were able to carry a handsome sum to the next year's account. Two important items in the accounts were the increased and increasing use of gas-stoves and slot meters. On June 30 there were 921 stoves on hire, and 1580 slot meters in use.

Dr. CALVERT seconded the motion, and it was carried.

A dividend was then declared at the rate of 7½ per cent. per annum, the retiring Directors and Auditor were re-elected, and the Chairman and Directors were thanked for their conduct of the business.

The proceedings concluded with a vote of thanks to the Secretary and Manager (Mr. William Belton).

A PUBLIC LIGHTING QUESTION.

A point was raised at the last meeting of the East and West Molesey District Council, upon which a little more light is required—as to whether or not it is imperatively necessary for a local authority to advertise for tenders for public lighting before entering into a contract with a gas company. It is quite understandable why they should do so where there are both gas and electricity companies operating in the district; but where a statutory gas company are the only suppliers of light, then it seems the height of foolishness to spend money in advertising. But that is what Mr. Ray wishes his Council to do, in order to conform with the letter of the law. Far be it from us to urge non-compliance with the law; but this is just one of those absurd restrictions which could have been well done without in, or might have been specifically excluded from, an otherwise very proper requirement. So far as Molesey is concerned, the points are these: A motion was on the *agenda* at a recent meeting, "that the Hampton Court Gas Company's terms for lighting the district with incandescent gas as presented by the Highways and Lighting Committee, be accepted." On the motion being reached, Mr. Ray objected, on a point of order, to it being put to the meeting. It was, he said, specially provided in the Public Health Act, section 174, that no council should enter into any contract or accept any tender exceeding the sum of £100 without first advertising the same and inviting applications for tenders for the work; and those tenders should be submitted to the Council. This was specially enacted to protect ratepayers in matters of this kind. The Chairman (Mr. H. J. Robertson) said it was questionable whether they could advertise for tenders when there was only one gas company to contract. The Hampton Court Gas Company had a monopoly in the place; and there was no alternative of receiving a tender from anyone but them. Mr. Ray: We can invite tenders for the lanterns and burners. The Chairman: Yes, what does that amount to? Mr. Ray: £361 in the Company's terms. After conferring with the Clerk, the Chairman said the amount mentioned by Mr. Ray included the provision of pipes and connections, which could only be done by the Company; but as the burners, new lanterns, and alterations to lanterns would cost £185, he thought Mr. Ray's contention was correct; and he had no right to put the motion. Mr. Ray said the Public Health Act further went on to say the work should be scheduled by the Surveyor of the Council, and the requirements must not be set out by a company. There was also the question of penalties in case the company did not supply the light according to contract. The whole thing had been hastily arranged. Mr. Alderton thought as the season was going on, and the streets were practically in darkness, it would be well if they could help matters on. They might accept the terms of the Company in regard to light and maintenance, and then push forward the matter of the burners and lanterns separately. The Committee had worked very hard in this matter, and something ought to be done. Mr. Ray contended that they could not go away from the notice before them; and the Chairman said he had already ruled it out of order. There the matter was blocked for the time.

BUILDING UP GAS BUSINESSES IN AMERICA.

From Mr. Frederick H. Shelton, of Philadelphia, we have received a very interesting compilation referring to a dozen and more gas companies in which he holds both official and directorial positions. In the series of "Business Sketches in America," by Mr. E. W. T. Richmond, published in the "JOURNAL" early in the year, we learnt a good deal about the incessant push and stimulus which some of our friends across the Atlantic put into their businesses, and of the remarkable results which many of them have achieved in consequence; and Mr. Shelton has supplied, in his booklet, examples of the effects of the enthusiasm which has been put into the concerns that have come largely under his charge. Old or neglected works have been taken in hand, new life has been infused into them, and a vigorous expansion has been the result. The figures, Mr. Shelton writes, "clearly reflect the results of a steadily increasing American policy of paying rather more attention to the commercial development of the business than the engineering end. But dipping into the matter in the book, it is seen that the latter has not by any means been neglected. In fact, we find that reformation or reorganization has started at the engineering end; and, this having been accomplished, the cultivation of the commercial side has been commenced and maintained with a good swing.

All the companies to which reference is made by Mr. Shelton have come under the new control within 28 months dating back from the 1st of August. Some of the works were previously in a wretched condition; and in others there was an indifference in regard to development, and consequently a stagnation of business. The methods of the new owners appear to have been to put the works into a thoroughly good condition, and in some cases rebuild them—at the same time, enlarging the plant in order to meet the increased demands which they felt sure would arise as the outcome of their efforts. The pipe system in all instances received careful attention—being enlarged and extended where required—commodious offices were provided, and extra facilities given for the gas-stove and appliances branch of the concern. Following this came a vigorous pushing of the business; and the companies adopted a very liberal policy in their dealings with their consumers. The owners were confident that good service and pushing methods would bring a good response; and their belief has been abundantly justified. The table which we give, and which tells its own story, proves that intelligent methods will build up a flourishing gas business in a small community as well as in a large town.

COMPANY.*	METERS.			GAS OUTPUT.		
	Number in Use Upon Starting or Acquiring.	Present Number in Use. Aug. 1, 1901.	Gain. Per Cent.	Sales for July before Development. Cub. Ft.	Sales for July, 1901. New Management. Cub. Ft.	Gain. Per Cent.
Jenkintown and Cheltenham (28)	515 Aug. 1, 1900.	783	52	701,000 1900.	1,308,400	86
Philadelphia Suburban (28)	368 Aug. 1, 1899.	2,227	505	543,200 1899.	4,010,200	638
Goshen (26)	443 J ne 1, 1899.	637	43	645,500 1899.	883,000	36
Sunbury (22)	169 Oct. 1, 1899.	474	180	161,000 1899.	508,000	215
Consolidated Schuylkill (22)	527 Oct. 1, 1899.	1,082	105	829,000 1899.	1,727,500	108
Coatesville (19)	267 Jan. 1, 1900.	664	148	467,600 1900.	1,015,800	117
Downingtown (12)	98 Aug. 1, 1900.	208	112	108,800 1900.	285,300	162
Hanover (7)	428 Jan. 1, 1901.	722	69	252,100 1900.	474,900	88
Petersburg (6)	587 Feb. 1, 1901.	725	23	452,900 1900.	628,100	38
Columbia (3)	718 May 1, 1900.	823 May 1, 1901.	14	848,600† 1900.	934,000†	10
New Orleans (3)	11,136 May 1, 1901.	14,327	29	12,307,000 1900.	18,656,000	51
New York and Richmond (½)	3,046 July 1, 1901.	3,112	2	4,346,500 1900.	5,156,000	18
Lynchburg (18)	627 Feb. 1, 1900.	909	45	545,200 1899.	759,100	39

* The period in months of the present ownership is given in parentheses after the names of the companies. † Monthly average for quarter.

COMMERCIAL GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year to June 30, which, with the accounts for this period, will be presented at the meeting of the proprietors on Thursday.

The Directors submit the accounts for the half year ended June 30, 1901. The revenue account shows a net profit for the half year of £44,651 10s. 2d. Deducting therefrom £6896 18s. 8d. for interest on debenture stock and loan, there remains standing to the credit of the net revenue account a balance of £37,754 11s. 6d. available for dividend. The Directors recommend the payment of dividends at the rates of 12 per cent. per annum upon the old stock of the Company, and of 9 per cent. per annum upon the new stock, both less income-tax. The Directors have had the satisfaction of reducing the price of gas from 3s. to 2s. 8d. per 1000 cubic feet, as from the taking of the Midsummer indices.

The accounts accompanying the report consist of the usual statements. They show that stock to the amount of £801,875 has been raised out of the total of £830,000 authorized; and that £253,287 has been borrowed out of £300,000 sanctioned. The receipts on capital account amount, with premiums, to £1,103,251; and the expenditure to £1,106,581; making the amount spent in excess of receipts £3330. In the six months covered by the accounts, £2321 was spent on new and additional buildings, plant, &c.; £1811 on mains, services, &c.; £352 on meters; £1542 on stoves; and £3109 on prepayment meters and fittings (less £2168 written off for depreciation)—making together a total of £9135. The reserve fund amounted on June 30 to £30,353—a sum of £10,340 having been carried to the net revenue account; and the insurance fund to £28,652. The balance-sheet shows that the value of stores at the close of the half year was as follows: Coals, oil, &c., £33,894; coke and breeze, £2369; tar, ammoniacal liquor, sulphate of ammonia, &c., £4320; and sundries, £18,355—making a total of £58,938. At the corresponding period of 1900 the figures were: Coals, oil, &c., £22,446; coke and breeze, £337; tar, liquor, and sulphate, £6758; and sundries, £17,236—making a total of £46,777. The revenue and net revenue accounts are given below.

Revenue Account.

Expenditure.

Manufacture of gas—			
Coals and oil, including dues, carriage, unloading, and trimming	£128,756 6 5		
Salaries of Engineer and Officers at works	2,536 10 0		
Wages (carbonizing)	20,397 19 8		
Purification—including £3453 6s. 10d. for labour	7,997 13 4		
Repair and maintenance of works and plant, materials, and labour, less £376 1s. 4d. received for old materials	18,947 3 4	£178,635 12 9	
Distribution of gas—			
Salaries and wages of officers, including rental clerks	£2,142 12 10		
Repair, maintenance, and renewal of mains and services, material, and labour	2,048 17 5		
Repair and renewal of meters	1,800 5 1		
" " " " stoves	2,154 6 7		
" " " " prepayment meters and fittings	2,168 4 10	10,314 6 9	
Public lamps—lighting and repairing		2,555 15 10	
Rent, rates, and taxes		9,497 9 8	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and Clerks	1,187 6 8		
Collectors' salaries and commission	1,621 2 3		
Prepayment meter collection	468 14 0		
Stationery and printing	705 2 7		
General charges	624 14 5	5,931 19 11	
Bad debts		804 5 7	
Discounts and allowances		1,915 7 0	
Law and Parliamentary charges		255 19 6	
Superannuations and allowances		209 10 1	
Official officers		111 14 2	
Total expenditure		£210,232 1 3	
Balance carried to net revenue account		44,651 10 2	
		£254,883 11 5	

Receipts.

Sale of gas—			
Common gas per meter, at 2s. 6d. and 3s. per 1000 feet	£187,052 7 11		
Public lighting and under contracts, common gas	10,187 0 9	£197,239 8 8	
Rental—			
Meter	£2,635 0 1		
Stove	2,333 0 7		
Prepayment meter and fittings	3,488 14 0	8,456 14 8	
Residual products—			
Coke, less £3887 14s. 3d. for labour	£32,249 1 1		
Breeze, less £649 2s. 5d. for labour	1,481 3 10		
Tar	6,389 4 1		
Ammoniacal liquor and sulphate of ammonia	8,873 14 2	48,993 3 2	
Miscellaneous receipts—			
Rent receivable	£166 17 5		
Transfer fees	27 7 6	194 4 11	
Total receipts		£254,883 11 5	

Net Revenue Account.

Balance on Dec. 31, 1900	£33,994 5 8	
Amount brought from reserve fund	10,340 1 10	£44,334 7 6
Less amount of dividend paid for half year ended Dec. 31, 1900		44,334 7 6
Balance from revenue account		44,651 10 2
		£44,651 10 2
Interest on debenture stock		£5,698 19 1
Interest balance		1,197 19 7
Balance available for dividend, carried to balance-sheet		37,754 11 6
		£44,651 10 2

The following are the statements relating to the manufacturing operations of the Company in the half year.

Statement of Coals.

Description.	In Store Dec. 31, 1900.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1901.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	28,427½	98,572	97,004	409	29,587
Cannel	3,480½	..	..	200	3,281
Total	31,908	98,572	97,004	609	32,868
Oil—gallons	259,246	1,456,419	1,528,150	..	187,515

Statement of Residual Products.

Description.	In Store Dec. 31, 1900.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1901.
Coke—tons	5,232	59,415	17,452	45,035	2,160
Breeze—tons	957	11,476	..	10,649	1,784
Tar—gallons	474,726	1,206,885	..	1,265,280	416,331
Ammoniacal liquor—butts	10,205	32,691	38,322	..	4,574
Sulphate of ammonia—tons	165	1,037	..	1,126	76

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,441,412	58,429	1,265,671	1,346,166	5,250

INCANDESCENT GAS LIGHTING IN COLOMBO.

The superiority in several respects of incandescent gas lighting over electric lighting is being recognized by local authorities in distant climes as it is in England. The interesting intelligence comes to hand that the Colombo Gas and Water Company, Limited, have lately signed two contracts with the Municipal Council—one for incandescent lighting for public purposes. This contract is for installing 2000 new incandescent lamps of 60-candle power each, and lighting and maintaining them for a period of five years. The lamps will be the property of the Council. The second contract is for supplying and laying upwards of 9 miles of 3-inch and 4-inch main as an extension of the Company's present system. By this addition, the length of mains will aggregate 74 miles. The total expenditure by the Council upon the two schemes amounts to Rs. 140,000. It may be mentioned that it was originally the intention of the Council to adopt electricity for the public lighting; and tenders were submitted by the local Tramway and Electric Lighting Company. But, after two years' deliberation, the Council finally settled upon incandescent gas lighting. We congratulate the Company and their Engineer and General Manager (Mr. Stephen Wellington) upon the successful agreement they have made, which cannot fail to have a salutary effect upon the business in the near future.

LEEDS CORPORATION GAS UNDERTAKING.

A Satisfactory Report.

At the Meeting of the Gas Committee last Wednesday, the results of the year's working of this department of the Corporation were presented in the draft annual report. Most of the statistics given are for the twelve months to June 30 last, as it was impossible to prepare some of them to March 25. The revenue account shows a net profit of £21,360 on the year's trading; and after deducting the sum of £14,941 set aside for sinking fund purposes, there remains a surplus of £6418. As compared with the previous year, the income from the sale of gas, residuals, and sundries has increased by £52,085; while on the expenditure side of the account, there is an increase of £13,720 in wages, purification, repairs, &c., and the cost of coal is £28,806 more. The capital account has been increased by £68,734, including £31,000 for the extension of mains and services, £12,000 for meters, £10,000 for stoves, and £4444 for a coke conveyor. The amount standing to the credit of the capital depreciation fund at March 25 last was £24,624, made up as follows: Gas-stoves, £7287; gas-works, £17,337. The quantity of gas made in the twelve months was 3,140,870,675 cubic feet, being an increase of 336,366 cubic feet on the previous year. The amount of coal and cannel carbonized was 309,619 tons, as against 316,365 tons, or 6746 tons less. The quantity of gas sold for the year ended June 30 last, was 2,838,417,262 cubic feet, and for the previous year 2,825,402,374 cubic feet—an increase of 13,014,888 cubic feet. The make of gas per ton was 10,144 cubic feet, as against 9926 feet; and the amount sold per ton 9167 feet, compared with 8930 feet. During the year 49,519 yards of mains have been laid for the supply of gas to new streets, and 19,795 yards to replace smaller and defective mains—the total being 39 miles 674 yards. The number of meters fixed to supply new customers was 10,737. The resolution of the Gas Committee that all meters should be brought in and tested once in ten years, is being carried out. The revenue account has been charged during the year with £14,941, on account of the sinking fund, which on March 25

amounted to £362,501, of which sum £131,048 has been applied to the repayment of debt. The amount invested and in the Treasurer's hands, and ultimately to be applied in redemption of debt, is £231,452. The average illuminating power of the gas, as tested at the works, has been 18·33 candles.

LEICESTER CORPORATION GAS AND ELECTRIC LIGHTING AND WATER DEPARTMENTS.

The Half-Yearly Financial Statements.

At the Meeting of the Leicester Town Council last Tuesday, the half-yearly accounts of the gas, electricity, and water undertakings were presented.

The Gas and Electric Lighting Committee reported that from the accounts of the gas undertaking for the half year ended June 30 last, it appeared that the net profit, after paying interest on the capital, was £15,239. Out of this had been paid £5390, being the half-year's amount of sinking fund; leaving a balance of £9849 to be applied at the end of the financial year (March 31 next), as the Council, under the Acts of 1878 and 1884, might direct. The accounts of the electric lighting undertaking showed that the result of the working for the six months was a net profit, after paying interest on capital, of £2065. Out of this had been paid £1068, the half-year's amount of sinking fund; leaving a balance of £997. The Committee reported that, in view of the reduced cost of coal, they felt justified in recommending the Council to lower the price of gas 2d. per 1000 cubic feet for all purposes, as from the end of the present half year.

Mr. EDWARDS first moved the adoption of the portion of the report dealing with the financial statement of the gas undertaking. In doing so, he alluded feelingly to the death of their Chairman, the late Mayor, who hitherto presented these reports. The increase in the consumption of gas had fallen from 5 per cent. to 1 per cent. There were three causes, in his opinion, for this falling-off. First, there was the depression in trade; next, the high price they had to charge consumers; and the third cause was the popularity of the electric light. There were at the present time 86,000 electric lights in the town; and this meant that there were 86,000 less gas-burners. One of the brightest features was the popularity of gas-stoves. They had at present over 30,000 gas-stoves in Leicester; and it was from these, gas-engines, and such things, that they might expect their profits in the future. He thought the Committee could be congratulated on having made a profit of £31,192, which was to be used in the following manner: They had paid £16,238 interest, which left them with a net profit of £15,239, out of which they had put £5390 to the sinking fund. This left them with a clear profit, which could be handed over to the Finance Committee, of £9849—nearly the sum which the late Mayor told them would be the profit for the whole of the year.

Mr. FLINT seconded the motion, and it was agreed to.

Mr. EDWARDS having moved, and Mr. M'CALL seconded, the adoption of the portion of the report referring to the electric undertaking,

Mr. BRUCE said he opposed the action of the Committee in carrying forward the net profits of £997 to add to the profit of £1649 already in hand. He thought the amount should go to the relief of the rates.

The motion, however, was carried, as was also that part of the report relating to the reduction in the price of gas.

The Water Committee reported that the accounts of the undertaking for the half year ended June 30 last showed that the net profit, after paying interest on capital, was £9619. Out of this sum had been paid £3194, the half-year's amount of sinking fund; leaving a net balance of £6425. The Committee proposed at the end of the financial year to carry this balance to the credit of the Special Water Fund authorized to be created under section 164 of the Derwent Valley Water Act; and they recommended the Council to approve this course.

On the motion of Alderman WOOD, seconded by Alderman VINCENT, the report was agreed to.

STREET LIGHTING IN GERMANY.

The Berlin Correspondent of the "Daily Telegraph" sends the following interesting paragraph: Thursday (Sept. 19) was in one sense the anniversary of a new epoch for Berlin. It was on Sept. 19, 1826, that gas was used for the first time in the streets of the Prussian capital for purposes of illumination. Up to then a few oil-lamps were seen at long intervals swinging with the wind as they hung suspended by iron chains; but the light shed from them was of so poor a quality that people returning at night from parties or from the theatre had to carry lanterns with them. In summer-time the illumination of the city at night was relegated to the moon! The staircases and entrances to houses remained all the year round at night in total darkness. Hanover was the first town in Germany to introduce gas for public illumination purposes; and Berlin followed suit the next year. It is interesting to note that it was an English Company that introduced this innovation into Germany. The contract with the Company to supply gas to the town of Berlin for twenty-one years was signed by the Minister of the Interior and the President of Police. The Municipality, as such, were not consulted at that time; but as soon as the twenty-one years were over, the Magistracy declared that they were able and willing to take over the illumination of the town with gas themselves. For this purpose, the King gave permission to the raising of a loan, and conferred on the Magistracy the privilege of supplying the town and private persons with gas, without prejudice, however, to the rights acquired by the English Company. In consequence of the existence of these latter rights, Berlin has been since 1847, when the Municipality acquired its privilege, in a very favourable position as regards light. The English Company declared that they would always supply gas 5 per cent. cheaper than the town. It is of further interest to compare the old condition of things three-quarters of a century ago with that of the present day. Berlin is now probably the best lighted city in Europe.

THE CORK GAS STRIKE AND ITS LESSONS.

[COMMUNICATED.]

The strike of gas-workers in Cork, which commenced in the middle of May, came to an end on the 24th ult. Its termination was the inevitable one, once the Directors of the Gas Company made up their minds to pursue a firm policy—viz., the surrender of the strikers. The workers who were employed to take the place of the strikers are to be retained; forty of the old hands—so many vacancies existing—are to be taken back at once; others are to be re-engaged as opportunity arises; and three of the ringleaders (the President, the Vice-President, and the Secretary) are to be permanently excluded. These are practically the conditions which the Directors laid down at the outset; and though the exasperating tactics of the leaders of the strikers and some of their sympathizers might justify a departure from them, the conciliatory course pursued is the best in the end. That the strike has cost the Company a considerable sum of money is beyond doubt. But it is a strong Company; and the shareholders may console themselves for present loss with the knowledge that the strike has been a blessing in disguise, which it most certainly has been, as a consideration of the facts will show.

The strike now over was almost unique, in that it was really caused by a liberal, nay even generous, treatment of the men. The Cork gas-workers were the envied of their fellow-labourers in Cork. To secure employment in the gas-works was regarded as an admirable piece of good luck. When the dispute—if dispute it could be strictly called—arose, there was no question of wages, hours, or other conditions of employment. The controversy, in fact, narrowed itself down to a question of discipline. Men long accustomed to a good deal of their own way could not willingly submit to those more stern rules on which the stability of all successful commercial concerns in these days of competition are based. So they refused to obey the lawful orders of the Manager, in whom they recognized a man determined to get a full week's work for a very good week's wages. Their leaders made no secret whatever of their determination to compel the Directors to get rid of the Manager, whose fairness was not questioned, but whose firmness was resented. In a word, the issue was whether the men or the Directors, through their Manager, should rule over the works. Had the Directors taken any other course than that which they pursued, they would have set an example of a most mischievous kind. Fortunately they decided to resist the monstrous assumption, no matter what the cost.

As has been said, the cost of the strike was considerable; but it was money well spent. The test of strength was bound to come sooner or later; and it was better that it should come when the men were ill-prepared, as they were when they struck, hoping to win their point by bringing the gas supply of the city to a full-stop, which they practically succeeded in doing for a brief space. But grave as the inconvenience was, popular opinion supported the Directors until they were able to restore the supply. Their reward has come in the shape of a discipline which will mean a substantial addition to the profits every year. Henceforth, new conditions will prevail in the gas-works; and it is to be hoped there will be no more disobedience to orders. It should never have been necessary to teach such a lesson; but as it was necessary, it is well that it has been effectively done. It will do the Directors as well as the men good to have it brought sharply home to them that thorough discipline and rigid economy are absolutely essential in these days of electric competition. There is such competition in Cork; but the Directors of the Gas Company need not greatly fear it, if they persevere in their present policy of firm control and economical administration. The foolish action of the men has made the thorough and permanent establishment of both all the easier. The lesson to be derived from the disciplinary aspect of the strike is obvious.

Of even greater importance to those interested in gas and water undertakings is the lesson taught by the strike in respect to definite agreements with the employees. The Directors of the Cork Gas Company, it may be remembered, instituted criminal proceedings against certain of the strikers under the Act of Parliament which makes it a punishable offence on the part of employees to wilfully break through their engagements, and thereby prevent companies and local authorities supplying the public with gas or water. This prosecution broke down on the legal point, raised on behalf of the strikers, that there was no definite agreement between them and the Company. It was held that the mere fact that the men were under weekly wages did not constitute a binding agreement. Accordingly, it was decided by the Magistrates that the Company could dismiss men without notice, and that the men could leave without notifying their employers. This legal point saved the strikers from punishment; but it had the further effect of putting them out of court in another and more important way. By relying on their legal right to leave without notice, they admitted that, when they ceased work, their connection with the Company terminated, and that, if they were ever taken back, it could only be under agreement, and on the conditions laid down by the Company. In fact, the legal victory of the strikers was worse than a defeat for them. One effect it had was to further alienate public feeling; for common-sense people could not see why they should have sympathy with men whose one defence of their conduct in throwing the city into darkness, and seriously inconveniencing traders, was that they were legally entitled to do so. Morally, of course, there was nothing at all in the plea. Up to the discovery of the point by an ingenious lawyer, both the Company and the employees considered themselves bound to each other during the good behaviour of the latter. So binding was the agreement, in fact, that the men were paid when sick, and received pensions in their old age. Other companies should take warning by this incident of the legal proceedings. A bare understanding, it would seem, no matter how long it has existed, and how firmly believed in by both parties, will not always suffice to bring employees of gas and water companies within the scope of the Act designed by Parliament for the protection of the public against loss and inconvenience. There should be a definite agreement in every case, so that no legal quibble may be raised to relieve employees of their moral obligations.

By teaching these useful lessons, the Cork gas-works strike must be

regarded as having its uses for others than the Company concerned. That the Company is certain to benefit materially may be taken for granted. It starts on a new career, so to speak. It has rid itself of an incubus in the shape of traditions, the growth of a couple of generations. No longer will it be hampered in its progressive policy by a disaffected working staff, and disaffected without cause. The men have been taught a salutary lesson, and are not likely to give trouble again on such a flimsy pretence that they should not be asked to put a few extra shovelfuls of coal into an over-heated retort! Cork, in common with other Irish centres, has seriously suffered from strikes like that which has just terminated. The strikes have been confined of late years, however, to the unskilled workers, whose admission to the ranks of organized labour has had mischievous results. This particular strike will further embitter public opinion against hasty action on the part of workers, while it has already had the good effect of awakening the people to the fact that anything which may illegitimately interfere with the prosperity of the gas-works is a menace to local industry and trade. In a word, the Cork gas strike is yet another illustration of the truth of the saying that, sometimes at all events, "out of evil cometh good."

Terms of the Settlement of the Dispute.

The terms on which the dispute has been settled are as follows: Men to carbonize the same amount of coal as heretofore, and receive the same wages. The quantity of coal carbonized per man is in the old retort-house 2 tons 10 cwt. per day, and in the new 2 tons 13 cwt. In future the men to give three weeks' notice in case of a strike; and the Company the same notice in case of a lockout. A week's notice on either side in ordinary circumstances. Forty old hands to be taken back immediately, the remainder within a month, with the exception of the three ringleaders of the strike—George Lane, President, J. O'Leary, Treasurer, and J. Gorman, Secretary of the Gas Workers' Association, who are to receive three months' wages in settlement of their cases.

Views from the Men's Side.

It will hardly be expected that the men will see the position in the same light, and read the same lessons from the strike, as the writer of the foregoing article. The United Trades Council of Cork (which is a curiously constructed organization, including men in all sorts of occupations, from a labourer to a musician) gave voice to the feelings of the men, at a meeting last Thursday. Evidently their view is that the termination of the trouble is a victory for them, and that the strike offers a lesson as to what combination can do. The settlement come to is regarded as of a satisfactory character. It is gratifying to see the promise that they (presumably all connected with the Trades Council) will do all they can to preserve and improve the prosperity of the Gas Company. Upon this, Mr. O'Gorman, the Secretary of the Gas Workers' Society, remarks that the fight is won; and the men "will now forget all differences, and work as faithfully in the future as they have done in the past!" We hope they will do so, and that they will not again so far forget their duty to the Company, the citizens, and themselves as to jeopardize the supply of gas as they did on this occasion. Their agreements may have some effect in preventing this.

DEPRECIATION FUNDS FOR PUBLIC WORKS.

Referring to the debate in the Glasgow Town Council, as reported in last week's "JOURNAL," when the question of depreciating the accounts for public works was considered (in this particular instance the electric light works were involved), a correspondent writes: The Corporation of Glasgow electric lighting undertaking is nine years old. It originated from the purchase of the small works of a pioneer firm, in order to give the Corporation a monopoly of the lighting. For three years, there were deficits; and then for two years there were surpluses. Since then whatever balances there have been, have been transferred to a reserve fund which was then created, until this year, when a deficit having again occurred, the whole of the accumulated reserve fund has been appropriated to wipe it out, which it does, leaving nothing over.

Whatever the state of the finances, our correspondent continues, every year till the present, the Corporation have written off sums for depreciation of works and plant; the total amount so written off having amounted to £45,552. The capital account has been growing very rapidly. Last year about £230,000 was added to it; and in the year before that the sum added was £306,000. The price of current has been fixed upon a regularly reducing scale. In these circumstances, the Electricity Committee at the end of the financial year, on May 31, found that they were not in a position to write off anything for depreciation; and they submitted their report on that basis, with the request that they might be allowed to pass this year without providing for depreciation. Their belief is that having, by lavish outlay upon new works and mains, made provision for an enormously increased demand, they will earn such a revenue this year as will enable them to resume the practice of allowing for depreciation. The Council by a majority approved of this policy.

There seems to be a considerable amount of haziness in the minds of the Councillors—as, indeed, is the case elsewhere—upon the subject of depreciation, which it may be well to consider. When the public are invited to subscribe capital for an undertaking, they are offered the security of a statutorily fixed sinking fund for the repayment of their capital. That is the protection of the lenders. But the ratepayers, to whom the works belong, are in the position that, the period of repayment having presumably been fixed with some reference to the duration of the works, they run the risk of, when they have repaid their obligations, being the possessors of worn-out works, and thus being obliged to start afresh with another loan to provide new works, with its concomitant provisions for repayment. That is the question in the abstract. Corporations usually set apart a reserve or contingent fund to meet exigencies; and, frequently, too, they write off every year a sum representing the depreciation of the works, with a view to making provision for their renewal. Sometimes the renewals are made year by year out of revenue; but whether in that way or by accumulating a depreciation fund, the provision is from revenue. That is to say, the ratepayers of the present day are made to provide works for posterity. That is all that there is in depreciation. If a Corporation resolve to provide for depreciation, then they will do it in hard cash; otherwise the provision will be a mere book entry, and will be of no value. Whether or not they are to do so is a matter which should be determined, and once determined, the policy, whichever it is, should be adhered to.

It is not politic to drop it, as has been done in Glasgow for one year, because continuity is broken, and financial continuity is of the essence of good business. In this instance in Glasgow, it would have been more businesslike to have brought out a deficit in the accounts, and to have carried it forward—the same as has been done in the gas accounts—rather than make the accounts appear to be square when they are not. There is nothing essentially wrong in what has been done; the best proof of which is in the fact that the eminent firm of accountants who audit the gas and the electricity accounts have certified both sets this year as correct, although in the one case depreciation has been allowed for, creating a deficit, while in the other depreciation has not been provided for in order to avoid a deficit. It is purely a matter of policy; and the Corporation have, it seems, departed from what was originally the right one. The result will probably be the same; but in the meantime the course pursued is a sort of financial plunging.

A NEW STREET LANTERN.

Designed for Incandescent Gas Lighting.

The long dark evenings which bring to gas suppliers what is called the lighting season, are almost upon us; and those responsible for the lighting of the streets have been, and are still, busily engaged in putting their lamps into order. Inquiries show that throughout the country incandescent lighting for public purposes continues to spread, and that makers of gas-fittings are constantly receiving orders for special lanterns suitable for incandescent burners. We are glad to hear this, because lanterns of larger dimensions and improved design and appearance have, when fitted with incandescent burners, a more imposing effect in a street than the old-fashioned 14-inch lanterns, which, although they can be made to pass for the purpose, are really ill-adapted, even when renovated, for No. 4 Kern burners. A lantern, which strikes us as being of good style, well designed, durable, and withal cheap, has just been introduced by Messrs. D. Hulett and Co., Limited, of High Holborn. We illustrate it above, although we cannot say that the reflector as depicted gives a fair idea of the interior of the upper part of the lamp. Instead of the usual tin and copper top, the metal portions of the upper part of this lantern are made of copper, and riveted. In addition, the lantern is fitted with a convex porcelain cone in place of a concave reflector; and, by its use, it is claimed that the maximum reflecting power is obtained. Reflection is further assisted by the top of the lantern being glazed with opal panels. Of course, there is nothing new in the latter; but the aim in designing the lantern has been to get the greatest benefit possible from the upper reflecting surfaces. If preferred by customers, metal panels with white undersides can be had. The lantern is only made in one size—17 inch, which is found in the experience of Messrs. Hulett and Co. to be the most suitable for the No. 4 Kern burner.

ELECTRIC LIGHTING NOTES.

When a deputation from the Penzance Corporation visited Plymouth and Torquay recently, to acquire information as to the working of the electric lighting undertakings, they went back with quite glowing accounts of the success which the Town Councils of those two boroughs had achieved. What success means in Plymouth, has been shown by the report of the Borough Treasurer, who has reminded the Council that, in spite of the greatly increased cost of public lighting, there is a present deficit on the electricity account of £3170; and that by the end of the current financial year this is expected to reach £5000. Torquay has a very similar tale to tell. The electric lighting undertaking of that town is three years old; and it has accumulated a deficit of £2459. This is equivalent to the yield of a rate of 5d. in the pound, and is in addition to an increase of £740, or 1½d. in the pound, which has been paid by the ratepayers for the luxury of having some of the streets lighted by electricity. With such examples before them, neighbouring corporations certainly show hardihood in venturing upon electric lighting undertakings. But corporations apparently find engineers' estimates more fascinating than the teachings of experience.

The Local Government Board inquiry held on Thursday last, with reference to the proposal of the Barnstaple Corporation to embark on an electric lighting scheme, was the means of eliciting the fact that the opposition to it is both numerous and powerful. Counsel appeared on both sides, and expert evidence was called not only in favour of, but also against the scheme. As has already been stated in the "JOURNAL," the Corporation propose to borrow £27,000 for the purpose of erecting works and laying mains in the centre of the town. The site for the generating station finally selected is in Castle Street, where the Corporation own some property; and it was pointed out that the premises, being near both the river and a railway, would offer exceptional advantages for discharging coal. Mr. W. H. Trentham, the Engineer of the scheme, expressed the opinion that it would be a financial success, and named some towns in which similar undertakings yield a profit. One of the places mentioned was Torquay; but it was admitted by witness, in cross-examination, that so far from having made a profit, Torquay had actually lost £2400, or at the rate of £800 a year, in the three years that the undertaking had been in existence. Mr. Lawson, who was called in opposition to the scheme, contended that it could not be made to pay, and that the Corporation would certainly lose money by it. Mr. Bodilly, Counsel for the opponents, said the scheme was only called for by a small number of persons, who did not care what loss was sustained, so long as it was borne by the general body of ratepayers. In a town like Barnstaple, there was not, nor was there likely to be, any large demand for the electric light. Mr. Weatherby, who appeared for the Corporation, suggested that the opposition was interested, and said that nothing was heard of it until July, when the Mayor ruled out of order a resolution against the scheme, on the ground that it stood in the name of a shareholder of the Gas Company. It is, however, a remarkable fact that there has been practically no discussion of the scheme, although its effect on the finances of the town will be to increase the indebtedness of Barnstaple threefold.

The new electric lighting works at Longton will possess more than ordinary interest for the gas engineer, inasmuch as (like Leicester, Stafford, Stockport, and maybe other places) they are to be worked in conjunction with the gas undertaking. They are, in fact, situated on the same site; and the designer was Mr. William Langford, the Gas Engineer, who will take the new concern under his charge. By the way, speaking of Mr. Langford's work at Longton permits us to congratulate him here upon the advance of £100 a year which the Corporation are giving him, and which is the reward of his energetic work for the Corporation—work which has produced some very satisfactory returns from the gas undertaking. The gas plant has undergone some large developments. In 1898, it may be remembered, extensions and alterations to the works, including the construction of a new retort-house, were carried out at a cost of about £20,000; and last year a water-gas plant was installed. Now we have the electric lighting works, the formal inauguration of which took place on Wednesday. As already mentioned, the site of the works is included in the area of the gas-works; and the cost of putting down the plant, &c., has amounted to about £21,000. The generating plant has been installed by the Electric Construction Company, of Wolverhampton. The boiler-house is 48 ft. by 48 ft., and is so designed that the floor is about 8 ft. 6 in. below that of the engine-room and yard frontage—thus giving every facility for tipping coal into bunkers, and minimizing the evil of the boilers priming. The height of the chimney stack from the boiler fire-bars to the top is about 158 feet; and the shaft internally is 6 feet diameter. The generating-room is 33½ ft. by 28½ ft., and contains two 150 kilowatts sets, with sufficient space left for a third generating set of the same power. The switchboard platform stands 3 ft. 3 in. above the floor-level, at the back of which is the battery-room—28 ft. by 28 ft. The steam required is provided by two Babcock and Wilcox patent water-tube boilers, each having 1619 square feet of heating-surface, and constructed for a daily working pressure of 160 lbs. per square inch; the boilers have been tested hydraulically up to 240 lbs. per square inch since erection. The accumulators consist of 244 cells, divided into two batteries, 122 for each side of the system.

The Battersea electric lighting installation was opened last Saturday by Mr. A. M. Torrance, the Chairman of the London County Council; and, of course, the London Press made a point of being represented, and have given the usual puffs. Something in the way of preliminary information was either supplied to the Editors or given to their gullible reporters by someone who possesses confidence of the first order in respect of electric lighting. For example, the "Daily Telegraph" headed a notice of the installation a few days before the event with the words "Light for London"—just as though London had been living in darkness before Battersea undertook electric lighting. The notice opens with the statement that the "enterprising Municipality" of Battersea "is now rejoicing in the prospect of illumination being shed upon many places which have hitherto been extremely dark." Subsequent sayings of the writer are too good to condense, and so we give them *in extenso*: "It is a matter for rejoicing in the borough that the entire work of installing the light has been carried out by the workmen of the local Council; and though the cost, which may be roughly stated at £152,000, is heavy, it is expected that a considerable saving on the old system will ultimately be made. It is the ambition of Battersea that the new light shall be used in the early future, not only for the purpose of illuminating the streets, but by private householders, some of whom now appear to be content with petroleum lamps. 'We shall try and bring the cost,' to quote the words of a local official, 'within the reach of the poorest of the poor.' At the present time, thousands of the dwellers in artisan buildings obtain their supply of gas by placing a penny in the slot; and this system, we learn, can be adapted to electrical purposes. Almost every important district in London now boasts of an electric supply; and in many—such as Battersea, St. Pancras, Poplar, Whitechapel, and Bermondsey—the Local Authorities have the matter in their own hands. So far, however, there has not been that large demand in London for electric light which was predicted when the new illuminant was first introduced to the public; and the obvious reason is the cheaper price of gas. The time is close at hand, however, according to authorities, when pretty well every house in London with any pretension to modern equipment will be fitted with the electric supply. As customers become more numerous, the price will become lower. Even now there are some places in the provinces where the electric light is cheaper than gas; and it was the opinion of our informant that London's turn in this respect cannot be long postponed. He went on to add that the wastefulness of private consumers was responsible chiefly for heavy electric light bills. The man who was formerly content with one gas-jet must have three little electric lights when one would suffice easily." No comment is needed on this palpably inspired effusion. During the proceedings on Saturday, the Chairman explained that the Electric Lighting Committee were at once to supply current for 240 arc lamps which had been erected, and in addition to cater for no less than 45,000 incandescent lamps of 8-candle power. It was intended to increase the plant, but the extent to which this would be done depended largely on the amount of private support given. At present the installation is equivalent to 1500-horse power in boilers, engines, and dynamos; but the buildings are so arranged that they will accommodate plant equal to 14,000-horse power.

Though somewhat ancient history now, many may still retain in mind the various steps that led up to the repudiation of the contracts entered into by the late City Commissioners of Sewers with the Laing, Wharton, and Down Company and the Brush Company in 1891, which contracting parties eventually became the Corporation of the City of London (on the dissolution of the Commissioners of Sewers under the 1897 Act) and the City of London Electric Lighting Company. Then followed the declaration by Counsel (Mr. Danckwerts, K.C.) that the contracts were as "dead as mutton," owing to the allegation that some members of the Corporation had infringed the now famous section 42 of the City of London Sewers Act, 1847, which prohibits "any Commissioner, Alderman, or Common Councillor of the City from being directly or indirectly interested or concerned in any contract which shall be made or entered into by, or on behalf of, the Commissioners." It will be remembered that, by the contracts, the Corporation obtained its current for public lighting at about 2½d. per unit; and the Corporation, it was understood, were to oppose the application of any competing electric light company for a Provisional Order. After the bursting of the bombshell by Mr. Danckwerts, an inquiry was held at the Guildhall by the Board of Trade, presided over by the late Sir Courtenay Boyle, as to the granting of a Provisional Order to the Charing Cross and Strand Company, the outcome of which was the granting of the Order. Subsequently the City of London Company appealed against the opinion of Mr. Danckwerts, with the result that they obtained a statement at law that the contracts for the three districts of the City were alive and valid, and not null and void. On a further appeal, it was declared that the contracts with the old Brush Company in the Western and Middle Districts of the City were invalid, while the remaining contract, for the Eastern District, entered into by the Laing, Wharton, and Down Syndicate, was in good order and alive. There is still a further appeal to the Lords that can be made. But in the meantime the Charing Cross Company have exploited the City; and anything but a happy state of feeling exists all round. The latest move is by the City of London Company, and it takes the shape of a communication to the Corporation. It came before the Court of Common Council at their weekly meeting on Thursday last. It offered "to continue the public lighting in the Western and Central Districts (in regard to which the contracts with the late Commissioners of Sewers have been declared invalid) at the same price, and subject to the same conditions as heretofore, provided the arrangements as to the public lighting in all three districts (Western, Central, and Eastern) be fixed until 1914, when the Corporation's power of purchase first arises." On the reading of the letter, Mr. Painter, the Chairman of the Streets Committee, moved that the communication be referred to the Streets Committee for consideration and report. Mr. W. O. Clough moved, as an addition, that "the Streets Committee, when reporting, should also report what negotiations they may have had with the Company, the advisability of appealing to the Lords, and also to consider the question of the purchasing of the undertaking." In support of his amendment, Mr. Clough said that if it was possible to end this matter, then by all means they should end it, for the credit of the Corporation was at stake. Certain financial papers were already advising investors not to put their money in the funds of the Corporation, as they were a body that repudiated their agreements. Mr. Lyle seconded the amendment. Mr. A. C. Morton opposed it, as it would be forcing the hands of the Streets Committee to purchase this "watered" Company. By the improper doings of members of the Corporation in 1891, the Company had obtained a monopoly in the city; but section 42 of the City Sewers Act of 1847 protected the citizens from being plundered by the Company for 42 years by a charge of 8d. per unit. "Do not bind the Streets Committee," said the hon. member; "everything is going on well, and legal advice is being taken." After some further discussion, Mr. Clough was urged to withdraw the last few words of his amendment relating to the "purchase of the undertaking," which he did. As it was generally considered that the letter of the Company was in the nature of an "olive branch," and marked a new point to start from in bringing the matter to an issue, the Chairman's resolution, with Mr. Clough's modified proposal tacked on, was carried.

PIPE-CASTING INDUSTRIES OF THE UNITED STATES.

A few months since, "The Engineer" had a series of articles dealing with the manufacture of pipes in the United States. Mr. Clark-Harrison, as one who claims to have had considerable experience in the manufacture of cast-iron pipes abroad—having acted for four years in the capacity of Vice-President and General Manager of the South Pittsburgh Pipe-Works—writes for our contemporary the following comparison of British and American pipes and foundry practice.

Extra Length.—All sizes of American pipes measure in length about 12 feet exclusive of the socket; whereas the small sizes of British pipes are only 9 feet. It is very evident that the extra length of American pipes is an advantage. The expense per length is in both cases practically the same for inspecting and testing with the hydraulic press; for transporting to the trench; for lowering into the trench; for making the joint with the necessary supply of lead and hemp; and for excavating several cubic feet of earth under the socket, so that the joint may be properly caulked. There are in each mile of (say) 10-inch diameter pipes, 587 lengths of British pipes, and 440 lengths of American pipes. Hence, if the total of this expense is "B" shillings for one length of pipe, it would be per mile 587 "B" shillings for British pipes, and only 440 "B" shillings for American pipes. That is, the extra length of American pipes reduces the expense of laying by 147 "B" shillings per mile, which is a saving equal to exactly 25 per cent. of the cost of laying British pipes. Nor is this the only advantage. In a mile of British 10-inch pipe, there are 147 more sockets than in a mile of American 10-inch pipe. The socket of an average 10-inch pipe weighs 50 lbs. or more. Hence by using American pipes of the same thickness of shell, one would effect a saving in metal of 147 times 50 lbs., or about 3¼ tons in every mile of pipe purchased.

Turned-and-Bored Pipe.—The only form of joint used in the United States by water-works and gas-works is the ordinary socket and spigot caulked with hemp and lead. It is considered superior to the turned-and-bored joint used so largely in Great Britain, for the reason that the latter fails to allow for expansion and contraction, and renders the line of pipe so rigid that the slightest settling of the ground is likely to cause either a fracture of the pipe or a leaky joint.

Cutting End Off in Lathe.—This is required by a large proportion of British specifications, on the principle that some slag or other impurities are invariably retained on the top of the mould—rendering it necessary to cut away that portion of the casting. In American practice it is not found necessary to cut off the spigot ends of the pipes, for the reason that the iron which is used is sufficiently high in graphitic carbon, silicon, and phosphorus to render the iron mixture so fluid when in a molten condition that the slag and impurities rise freely to the top of the ladle, and are not allowed to enter the mould. The fact that American foundries have been making a satisfactory quality of pipes for more than half-a-century without resorting to this practice of cutting off the spigot-ends, would be sufficient evidence that it is unnecessary, providing a proper quality of iron is used. Hence, why do British makers incur this extra expense in manufacturing, and so place themselves at a disadvantage in competing against American manufacturers?

COAL-TAR INDUSTRY.

One of the papers read before the Chemical Section of the British Association at the Glasgow meeting last month was by Dr. A. G. Green. The author said that, owing to the numerous ramifications of the coal-tar industry, and the manifold applications to which its products were applied, it might be regarded as the pulse of chemical industry as a whole. Fifteen years ago, England, although the originator of the manufacture of aniline dyes, was not holding its own against Germany, but was, at any rate, supplying Germany with the raw material. Now, even that was not the case; for, owing to the ample introduction of coke-ovens, in which bye-products were recovered, Germany was producing coal-tar in plenty for its own use, and in other departments of the industry the relative position of the two countries was still worse for us. The export of coal-tar colours from Germany, exclusive of alizarines, was 4646 tons in 1885 and 17,639 tons in 1899. In 1894 the value of the total exports of these colours amounted to £2,600,000, and in 1898 to £3,500,000. The value of the total chemical industry of Germany in 1897 was £46,500,000. At least one-tenth of this might be put down to colouring matters, and another tenth to other coal-tar products—making the coal-tar industry in Germany of an annual value of £9,000,000 to £10,000,000. This remarkable activity had caused vast sums of money to be usefully invested, and was giving employment to increasing numbers of workpeople. The Badische-Anilin Fabrik in 1889 had a capital of £900,000, which had now been increased by £750,000; while the number of workpeople employed (4800) in 1896 had risen to 6485 in 1900. The total capital of the six largest coal-tar colour firms in Germany amounted to at least £2,500,000. They employed about 500 chemists, 350 engineers and technical men, 1360 business managers, clerks, and travellers, and over 1800 workpeople. The total capital invested in the coal-tar colour trade in England did not exceed £500,000. The total number of chemists employed could not be more than 30 or 40; and the number of workmen engaged in the manufacture probably did not amount to over 1000. The exports of coal-tar colours from England had fallen from £530,000 in 1890 to £366,000 in 1900. The imports, on the other hand, had steadily increased from £509,000 in 1886 to £720,000 in 1900. The colours used by the Bradford Dyers' Association were 10 per cent. of English make, 80 per cent. German, 6 per cent. Swiss, and 4 per cent. French. It was, Dr. Green said, apathy toward higher education and research that was the cause of this decadence. Moreover, the encouragement given to chemical research work by these great industries was enormous, and this great educational factor was lost to us.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 838.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME	Closing Prices.	Rise or Fall in Wk	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	19½—20½	..	4 17 7
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	May 15	6½	Bombay, Ltd. . . .	6¼—6⅜	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	+3	4 8 11
270,000	,,	,,	9	Do. New . . .	192—197	+2	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	+4½	3 14 1
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	113—116	+2	3 9 0
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	220—225	..	4 8 11
246,320	,,	,,	7	Do. A. Ord. Stk. .	153—158	..	4 8 7
1,047,500	Stk.	Aug. 28	5	Bristol, 5 p.c. max. .	116½—117½	..	4 5 1
420,000	20	Sept. 27	10	British.	41—42*	+½	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	May 31	6	Buenos Ayres (New) Ltd.	9—9⅛	..	6 6 4
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	July 17	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept 27	10	Cape Town & Dis., Ltd.	14⅜—15½*	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	277—282	+4½	4 5 1
236,425	,,	,,	9	Do. New do. .	207—212	+2	4 4 11
238,237	,,	June 14	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	May 31	9	Continental Union, Ltd.	163—168	+1	5 7 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	162—167	..	4 3 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 1/16	Gas-light and Coke	4 p.c. Ord. . .	98—100	+2	4 8 0
					3½ p.c. max. .	88—90	..	3 17 9
					4 p.c. Con. Pref.	111—114	..	3 10 2
					3 p.c. Con. Deb.	91—93	..	3 4 6
2,600,000	,,	,,	3½	Hongkong & China, Ltd.	13—14	..	5 14 4
3,799,735	,,	,,	4	Imperial Continental .	212—215	+2	4 13 0
4,063,425	,,	June 14	3	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
70,000	10	May 31	8	Liverpool United A	231—233	..	4 5 10
3,800,000	Stk.	May 15	10	Do. do. B	170—172	..	4 1 5
473,600	Stk.	Aug. 15	3½	Do. do. Deb. Stk.	119—120	..	3 6 8
561,000	Stk.	Aug. 29	10	Malta & Medn., Ltd. .	4½—5	..	4 0 0
718,100	,,	,,	7	Met. of 5 p.c. Deb.	106—109	..	4 11 9
306,083	,,	June 28	4	Melbourne 4½ p.c. Deb.	104—106	..	4 4 11
75,000	5	June 14	4	Monte Video, Ltd. . .	9—10	..	7 0 0
560,000	100	Apl. 1	5	Newc'tle & G'tesh'd Con.	224—226	..	3 15 3
250,000	100	,,	4½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
541,920	20	May 31	3½	Oriental, Ltd. . . .	7⅞—8¼	..	4 17 5
717,946	Stk.	Aug. 9	8½	Do. New, £4 10s. pd.	7—7⅛	..	4 16 0
312,855	Stk.	June 28	3½	Do. do. 1879, £1 pd.	1⅛—1⅜	..	4 11 5
150,000	5	May 15	8				
135,000	5	,,	8				
15,000	5	,,	8				

*Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Sept. 27	7	Ottoman, Ltd. . . .	5⅞—6¼*	+¼	5 12 0
851,070	10	Apl. 26	7	River Plate Ord. . .	10¾—11¼	..	6 4 5
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	11—12*	+⅛	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	240—243*	+2	4 2 4
209,984	,,	,,	10	Do. B	240—243*	+2	4 2 4
523,498	,,	,,	10	Do. C	240—243*	+2	4 2 4
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	125—128	..	3 18 2
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	91—94	..	3 3 10
380,940	Stk.	May 15	5	Southampton Ord. . .	107—112	+1	4 9 3
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton A. 5 p.c.	115—120	..	4 11 8
250,520	,,	,,	4	B. 3½ p.c.	85—90	..	4 8 11
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9½—10¾	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .	12—13	..	4 12 4
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.	103—108	..	3 14 1
				WATER COMPANIES.			
780,599	Stk.	June 28	11	Chelsea, Ord. . .	300—305	+5	3 12 2
150,000	,,	,,	5	Do. 5 p.c. Pref. .	152—157	+2	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	+3	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb. .	138—143*	.	3 2 11
1,720,560	Stk.	Apl. 12	7½	East London, Ord. . .	200—205	+12	3 8 4
654,740	,,	June 14	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10
700,000	50	June 14	8	Grand 10 p.c. max..	110—113	+3	3 10 10
310,000	Stk.	Sept. 27	4	Junction 4 p.c. Deb..	122—126*	+1	3 3 6
708,000	Stk.	Aug. 15	14	Kent	285—295	+4½	4 14 11
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max..	285—290	+10	3 12 5
406,200	100	,,	8	Do. 7½ p.c. max..	212—217	+5	3 13 9
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb..	123—128*	..	3 2 6
500,000	100	Aug. 15	12 5/10	New River, New Shares	392—397	..	3 4 6
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	June 14	6	Southwark Ord. . . .	182—187	+4	3 4 2
126,500	100	,,	6	and 7½ p.c. max.	167—172	..	3 9 9
489,200	Stk.	,,	5	and 5 p.c. Pref..	147—152	..	3 5 9
1,019,585	,,	Apl. 12	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 14	10	West Middlesex . . .	277—282	+5	3 10 11
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Sept. 12	3	Do. 3 p.c. Deb. .	94—97*	..	3 1 10

*Ex. div.

CARDIFF WATER SUPPLY.

A New Reservoir Projected.

The provision of an additional reservoir for Cardiff, which the Chairman of the Water-Works Committee (Alderman David Jones) stated at the last meeting of that body would have to be seriously considered almost at once, will involve the town—the "South Wales Daily News" states—in an expenditure of something like a quarter of a million; and unfortunately it is one of those requisites which cannot be put off simply because the town has already other big schemes in hand.

When the town purchased the undertaking of the old Water Company in 1879 for somewhere about £320,000, there was only the Lisvane reservoir in existence. The powers of the Company were included in the purchase; and these provided for the Llanishen reservoir, and also gave the rights of drainage over a large collecting area in the vicinity. The Corporation at once proceeded with the construction of the Llanishen reservoir, which, when completed in 1886, had a capacity of 317 million gallons. They continued to get their supply from the surrounding area, the rights of which the old Company possessed, until the Cantreff reservoir was filled in 1892. But thereafter they rejected all water from the Llanishen locality; and the surplus now runs into he Roath Brook, which feeds the Roath Park lake. The water is not utilized now, as the collecting ground is all cultivated land; and consequently the analysis is not sufficiently good for domestic purposes.

Since the time of the purchase from the Company, it has been a steady work of progress; for the demands of the town have gone on increasing year by year, and to keep pace with this demand a heavy outlay has had to be continually made. When Llanishen was completed, and the demand so increased as to make the town look out for another area of collection, parliamentary powers were obtained for the Taff Vawr scheme. Here a collecting ground, 10,000 acres in extent, was purchased; and the Cantreff reservoir was completed in 1892, at a cost of £160,000, and with a storage capacity of 322 million gallons. Then the No. 1 or Beacons reservoir was taken in hand; and after several years' work carried on by the Corporation themselves, at an expenditure of £213,000, this part of the scheme was finished in 1892. The Beacons' capacity is 315 million gallons; and since the Corporation bought out the Company, they have increased the storage capacity from 80 million gallons to 1064 millions, excluding the 2 million gallons at Cogan, the same quantity at the Penhill service, 610,000 gallons at Llandough, and 3 millions at the Penylan service reservoir. The other storage places are 560,000 gallons at the Cefn balancing reservoir, 560,000 gallons at Blackbrook, 700,000 gallons at Rhubina, 120,000 gallons in the filter-beds, and 1,300,000 gallons in the covered service reservoir at the filter-beds. This gives the entire storage capacity.

Out of the 10,000 acres of collecting ground, 4000 acres are utilized by the present reservoirs; and there remain 6000 acres to supply the third reservoir, for which the original scheme provided. This reservoir would have a much larger capacity than the others—viz., 670 million gallons—and when completed would exhaust the watershed. The estimated cost at the time parliamentary powers were obtained was £213,000; but the increased cost of material and labour would bring the outlay now to £250,000.

The chief difficulty would be the compensation water. At present nearly 3 million gallons have to be paid out as compensation daily; and if the remainder of the collecting area was appropriated, just over 7 million gallons would have to be sent down the stream. Of course, the mill-owners get the benefit—Cyfarthfa principally; for they receive a steady supply in times of drought, and it saves them impounding water, as Dowlais does at present, to provide for times of scanty supply. The consumption of Cardiff and district varies from 4½ to 5½ million gallons per day; and to this has to be added the 3 millions compensation water. It is estimated that, the increased compensation included, the new reservoir would provide an additional 3 million gallons per day.

The question which the Chairman has told the Committee they will have to consider is whether it will be best to build the reservoir at Taff Vawr or secure a site for another storage reservoir near Llanishen. It would save the additional compensation demand; but against this the price of the land would be very considerably higher.

TEIGNMOUTH WATER SUPPLY.

Proposed Gravitation Scheme.

Mr. Deacon has presented to the Teignmouth District Council a report on a scheme for supplying the town with water, which had been suggested by Mr. C. E. Jones, the Surveyor to the Council. The proposal is to impound a portion of the water of the Beadon Brook—a stream flowing through the Hyner Valley on Dartmoor. The Torquay Corporation already intercept a portion of the stream for the purposes of their water supply; but sufficient still remains to give an average of 464,000 gallons a day to Teignmouth. Mr. Deacon estimates that, under a constant supply, the consumption will not be less than 267,000 gallons a day; and he proposes that provision should be made for at least double this quantity. As the proposed reservoir would give less than this double quantity of 534,000 gallons, he advises that the two existing pumping stations at Mylor and Shaldon, which yield an excellent quality of water, shall be retained—to be used as occasion may require and the demand increases—to supplement the gravitation supply. The scheme contemplates the construction of a reservoir in the Hyner Valley, in which the drainage area is situated, on the granite of Dartmoor. The quality of the water is unexceptional; and though there are three farmhouses upon the drainage area, they are so situated that there would be no risk of pollution of the water from that source. The water-mains from the Torquay reservoirs at present pass through a portion of the ground which would be occupied by the proposed reservoir; but they can be easily raised. Mr. Deacon estimates the cost of the scheme at £75,000; while the capitalized cost of obtaining a supply from the works which are being constructed by the

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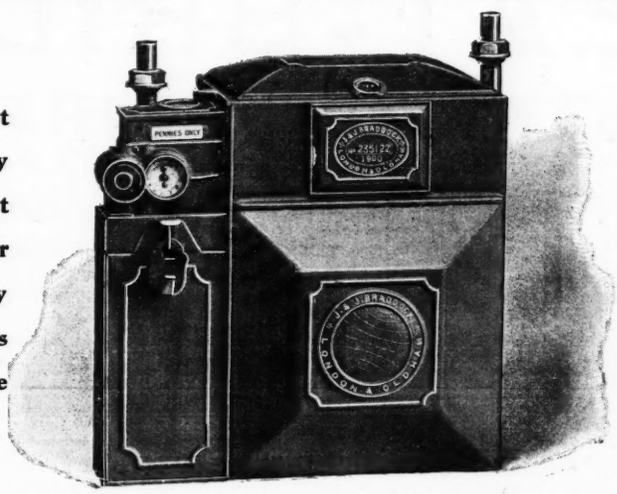

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Paignton District Council is £132,710, or 76 per cent. more. At a meeting of the Teignmouth District Council last week, which was held to consider the matter, Mr. Harris moved that a Bill be promoted in the next session of Parliament for power to carry out the scheme. He said it was absolutely essential that they should provide for the town a constant water supply at every period of the year. The motion was carried; only two members voting against it.

CITY OF SANTOS WATER SUPPLY.

The annual report of the Secretary of State for Agriculture, Public Works, &c., to the President of the State of San Paulo (Brazil), for the year 1900, contains a very satisfactory official recognition of the way in which the important works of the new water supply to Santos, recently completed by the City of Santos Improvements Company, Limited, have been executed. The service of distribution as carried out reflects credit on the Engineers and Managers of the Company, and is most gratifying to the Directors, as it shows that their efforts to endow the City and Port of Santos with an abundant and perfect supply of water have been appreciated by the Government of the State, and by the Municipality and people of Santos.

The report (translated) says: "The water supply to the City of Santos, fiscalized by the Department of Water and Drainage Works, in accordance with the contract dated May 24, 1897 (between the State Government and the City of Santos Improvements Company, Limited), has been conducted with regularity, without any accident worthy of note in the network of distribution in the city, or the fracture of a single pipe in the mains (some 15 miles in length) from the source to the city. There has not been any complaint whatever from private consumers as to insufficiency of water supply. The objection which the people of the city appeared in the first instance to have against the use of water-meters has disappeared entirely, owing to the satisfactory manner in which this service has been carried out. Statistics of the average daily consumption of water show a sensible diminution in the quantity of water wasted. This reduction—the evident result of the system of meters adopted—proves that the population have become convinced that they themselves should endeavour to prevent unnecessary waste of water."

WATER SUPPLY IN QUEENSLAND.

Mr. R. Logan Jack, LL.D., F.G.S., during the twenty-three years that he was Geologist-in-Chief in Queensland applied his geological knowledge to the solution of the question of the water supply of the State. The results of his work were embodied in a paper read before the Geology Section of the British Association, at the recent meeting.

Mr. Jack described the western interior of Queensland as being a vast area of magnificent pastoral country, but not endowed with a sufficient rainfall. In 1881 the author had reason to suspect that the cretaceous rocks of the Western Downs afforded conditions favourable for the discovery of artesian water. Subsequently, in 1885, he (then Government Geologist), with Mr. J. B. Henderson, Hydraulic Engineer, made a study of the area, and an experimental bore was put down which proved a success. From Mr. Henderson's annual report for 1899-1900, it appeared that up to June, 1900, 185 miles of boring had been made in search of artesian water in the district, and a large proportion of the bores had been successful. Though the artesian water did not fully compensate for the lack of rain, still the bores had already produced an important change in the conditions of life in the interior. The greater part of the western interior of Queensland was composed of soft strata of lower cretaceous age, consisting of clay-shales, limestones, and sandstones. These strata were so disposed that the lower members of the series crop out on the western flanks of the coast range, where not only was the elevation of the surface greater than in the downs to the west, but the rainfall was also comparatively abundant. Along the eastern margin of the cretaceous area, there was a porous sandstone of great thickness, the "Blythesdale Braystone;" and owing to low dip, the outcrop of this permeable stratum occupied a belt from 5 to 25 miles wide. But the Braystone finally disappeared beneath the argillaceous and calcareous upper members of the series which formed the surface of the downs to the west. Several rivers disappear while crossing the outcrop of the Braystone; and the water must be carried in it beneath the clay-shales of the downs. The outcrop of the Braystone was concealed over part of the area by nearly horizontal tablelands of the "Desert Sandstone"—an upper member of the cretaceous formation lying unconformably on the lower divisions. It was, however, also of a permeable nature. The author gave an estimate of the water which should penetrate the Braystone, and suggested the probability that much of it found an outlet under the sea in the Great Australian Bight and the Gulf of Carpentaria. The artesian water basins were, in fact, broken basins, and the break gave rise to leakage either on land or beneath the sea. In places, therefore, the water rises in a bore, but does not reach the surface owing to the site of the bore being higher than the head of pressure. This was termed "sub-artesian water;" and the author gave illustrations of both artesian and sub-artesian water in the district in question.

In the discussion, Professor Edward Hull remarked on the immense importance of the subject, and said they all regarded Dr. Jack as a great benefactor to Queensland. Miss Raisin, as one who had practical experience of the changes brought about by the artesian system, thanked Dr. Jack for his work. Professor Lapworth said that they could not over-estimate the interest of the subject which Dr. Jack had brought before them; and he congratulated the people of Queensland on having for many years secured his services, which had benefited that great community. The demand for water, he went on to say, was becoming so great that it was a serious question whether 50 or 60 years hence, our water supply would be practically gone. All, or almost all, the best water areas had been already used up.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Falkirk Corporation Gas Department were considered by the Town Council on Monday. In presenting them, Mr. Robertson said the gross expenditure at the beginning of the year was £117,175. During the twelve months they added £2057 to this, making their gross capital now £119,232. The revenue for the year amounted to £24,314, as compared with £20,996 in the previous year. From gas the receipts were £20,020, as compared with £17,826; and residual products yielded £4212, as against £3086. The total expenditure was £18,243, as compared with £14,802. Manufacture and distribution of gas cost £15,236, as against £12,542. The gross profit was £6071, or a decrease of £121 when compared with the previous year; but there was still a balance of £1932 at the credit of profit and loss account. They began the year with a credit balance of £1429, which, added to the £6070, made a total of £7499. Out of this they had paid interest amounting to £3411, provided for sinking fund £1823, paid in income-tax £309, and allowed for bad debts £23. They had increased their contribution to the sinking fund by £600. They had borrowing powers to the amount of £200,000; and of this they had still to raise £88,046. During the year they had extinguished stock to the amount of £835; and they had set aside £1973 for the payment of debt on the undertaking, which, added to £5171 formerly so applied, makes a total of £7144, which the Corporation have either in the bank or invested against the debt on the gas undertaking. This very satisfactory financial statement was adopted unanimously by the Town Council.

Owing to statutory requirements, the closing of the accounts of the Arbroath Gas Corporation now takes place at May 15, instead of at July 15, as formerly. There was therefore, at the annual meeting of the Corporation on Thursday, the working of the undertaking for a period of only ten months to consider. The report of the Auditor brought out an excess of expenditure over revenue of £496. The estimated revenue for the current year was £15,340, and showed an apparent surplus over expenditure of £243, reckoning the price of gas at 4s. 4½d. per 1000 cubic feet—the same price as ruled last year. Mr. Robertson, the Convener of the Finance Committee, moved the approval of the accounts and estimates, and that the price of gas should be fixed at 4s. 4½d. per 1000 cubic feet. He stated that the estimates had been very carefully considered. For the current year, there would be a saving of about 4s. per ton on the price of coal. The Finance Committee were hopeful that they would have been able to recommend a reduction in the price of gas; but owing to a shortage in the quantity of coal in stock having been discovered, this had been found to be impossible. The shortage amounted to 414 tons; and after careful and minute examination, he, as Convener of the Finance Committee, and Mr. Robbie, as Convener of the Works Committee, had arrived at the conclusion that the deficiency had arisen in this way: The coal was taken from the store in barrowfuls; and it seemed that the weighing had not been done with sufficient care by the stokers. This had gone on for some six or seven years, with the result that the quantity of shortage had mounted up to the figure mentioned. The sum which they had to allow for the shortage of 414 tons would be, at current rates, £540. Consequently it was found impossible to lower the price of gas this year. Taking into account a deficit from the past two years, and the amount which represented the shortage of coal, the Committee considered that they were fortunate in not having to recommend an increase. Mr. Lorimer asked if it was a mere supposition on the part of the Committee that the shortage had arisen in the way stated, or if it had been ascertained as a fact. Mr. Robertson replied that it was a mere supposition. They had no positive proof. He and Mr. Robbie, however, had spent nearly a whole week at the gas-works investigating the matter, and the result was as he had stated. He did not suppose anyone would allege that the coal had been wrongly done away with. It was resolved to hear Mr. Carlow on the subject, and he said he had inadvertently neglected to allow for shrinkage, and for the fact that, as was well known, a few pounds overweight were generally allowed in taking the barrows over the steel-yard. In the course of a year, the barrows passed over the steel-yard about 28,000 times; and allowing about 5 lbs. on each barrow for seven years, this would bring out about 437 tons. He admitted that he had made a mistake in not allowing a percentage for shrinkage on his stock, and for the weighing of the barrows. The accounts were approved of; and a Committee was appointed to inquire into the operations at the gas-works.

At the same meeting, it was agreed to borrow £3000 to pay off a bank overdraft; the following sums falling to be charged to the Corporation capital account: Cost of 1899 Act of Parliament (borrowing powers), £473; cost of Electric Lighting Order, £402; balance of cost of new gasholder, £131; balance of cost of new retort-bench £513; and required for working capital, £1479.

On again looking over the accounts of the Glasgow Corporation Gas and Electricity Departments, I have been impressed with the extraordinary discrepancy there is between the position of the capital accounts of the two concerns. The gas undertaking is 32 years old; and in that time they have incurred a capital liability of £2,100,698. The electricity undertaking is nine years old; and their capital liability is already £857,633. There are 206,564 gas consumers; and thus, making no allowance for repaid capital, the outlay of the Gas Committee per consumer has been at the rate of about £10. There are 4031 electricity consumers; and the outlay of the Corporation for each of them has been at the rate of about £212. These are costly customers. The Corporation can make a profit on a gas consumer if they charge him 6s. a year over working expenses, to meet interest at 3 per cent. on £10. Before they can realize a profit upon the sale of electricity, they require to charge each customer £6 8s. a year over working expenses.

The Town Council of Rothesay have resolved to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet. The Town Council of North Berwick have lowered the charge for gas from 4s. 7d. to 4s. 2d. per 1000 cubic feet.

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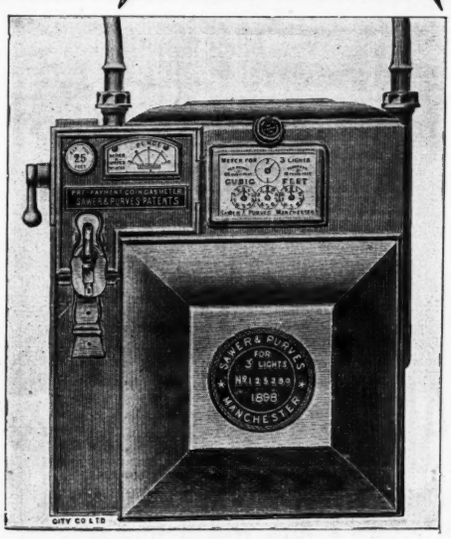
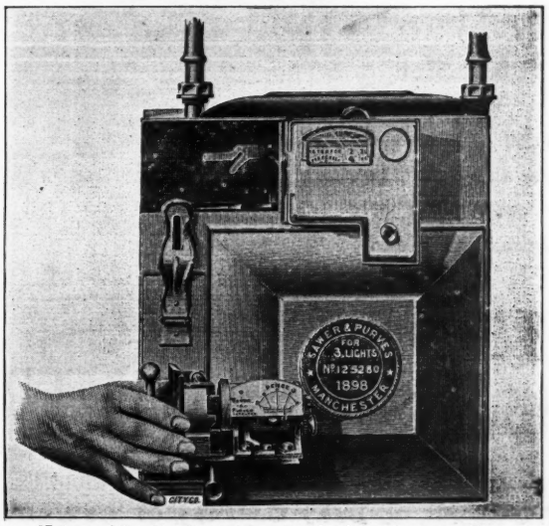


Meter in working position.



Meter with attachment removed without uncoupling.

the stand of the Home and Colonial Gas Syndicate, Limited (the Company who are lighting the home-farm and several adjoining exhibits), Mr. Edward G. Peyton said that in Germany, where over 35 towns and the State railways are lighted by acetylene gas, automatic appliances have all but disappeared in favour of the non-automatic or storage system. For street lighting by means of branch stations, acetylene had been proved to be in every respect superior to, and cheaper than, incandescent gas or electric lighting.

At a meeting of the Edinburgh and District Water Trust a week ago, Mr. Wood, the Convener of the Finance Committee, moved that the domestic water-rate remain at 5d. per pound, that the shop rate be 2d. per pound, and that the public rate remain at 1d. per pound. He stated that the expenditure for the current year had been estimated at £113,625. During the past year, the actual expenditure was £110,106. The sum required to pay interest on borrowed money amounts this year to £36,130—an increase of £4677, due to expenditure upon new works. The provision for sinking fund amounts to £15,019, as compared with £14,543. The mortgage debt of the Trust amounts to £1,400,606, of which £197,693 remains unexpended. The revenue is estimated at £110,042—leaving an anticipated deficit of £3583, which will be made up from the reserve fund, the amount of which is £32,819. It is anticipated that £56,714 will be derived from rates, as against £55,123; that meter supplies will produce £38,227, as against £37,716; and that special and miscellaneous purposes, which are estimated to produce about the same as last year, will make up the balance. The rates were fixed as proposed.

The Falkirk and Larbert Water Trust began their last financial year with a capital account of £109,000. During the year they repaid £8245, which reduced the account to £100,755; but there were capital outlays which again raised the account to £104,754, at which it now stands. Of the capital expenditure during the year, £3123 was expenses incurred in procuring an Act of Parliament in 1900, the total cost of which had been £4017. The revenue during the year was £8565, as compared with £8008 the previous year. There was an increase of £1048 in the amount derived from rates; but this was partly owing to extension of the district, for which reason there was a decrease in the revenue derived from outside supplies. The ordinary expenditure during the year was £7744—an increase of £611 over that of the previous year.

On Saturday last, an augmentation to the water supply of the burgh of Kilmarnock was inaugurated. The supply was acquired from a Company by the Corporation in 1892; and shortly afterwards an extension of the water-works was resolved upon. The scheme was designed by Messrs. J. & A. Leslie and Reid; and the work has been completed—since the death a year ago of Mr. Wilson, of that firm—by Mr. Niven, of Glasgow. A reservoir, covering about 30 acres, and of a storage capacity of 135 million gallons, has been constructed on Fenwick Moor, about eight miles from the town. The water is taken from the Dunton Burn. The total cost of the work has been about £62,000.

The rainfall in Scotland is 6 or 7 inches less this year than it was at the same date last year. The defective fall is telling heavily upon water supplies, which have, in addition, been drawn upon more largely this year than usual, on account of the very warm weather of the past summer. The Edinburgh and District Water Trust have restricted the supply to their district by 2 million gallons per day, and have issued warnings against waste. At Falkirk the supply was down to about six or seven days; but heavy rain fell on Thursday night, and the reservoirs are re-filling. There is also great scarcity of water at Kirkcaldy and Cowdenbeath.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 28.

Sulphate of Ammonia.—There has been a steady market; and the quotations remain at £10 12s. 6d. per ton f.o.b. Hull, £10 15s. per ton f.o.b. Leith, and £10 18s. 9d. per ton f.o.b. Liverpool. The bulk of the supply has again been taken for covering purposes; but there has been a fair amount of direct demand, both for prompt and October delivery, and production has been readily absorbed as it has become available. There is nowhere any stock to carry over. It is reported that £11 2s. 6d. per ton f.o.b. Leith has been paid for January-April delivery; but although there has been increased interest in the forward position, buyers have generally refused to pay the premium required by producers.

Nitrate of Soda is firm in all positions; and spot prices remain 9s. 3d. to 9s. 4½d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Sept.* 28.

Tar Products.—The demand for pitch continues good from South Wales, especially for early delivery. The fuel makers are pressing for deliveries; and very high prices are being paid for immediate supplies. The market, however, is certainly not so firm for next year, as the manufacturers do not anticipate any scarcity later on. The London price remains at 32s. in any position. But at present consumers offer only 31s. 6d.; and even at this the demand is principally for prompt delivery. Business has again been done in 90 per cent. benzol at 9½d. for September-October; while one transaction is reported at 10d. for November-January. In 50-90 per cent., further sales are reported at 9½d. for October-December, and in one instance 10d. is said to have been paid for prompt shipment. In anthracene, there is nothing fresh to report; there being an entire absence of business. Values are therefore purely nominal. As regards carbolic, a good deal of business has been done in 60's for prompt delivery, 2s. having been paid in some instances for September shipment. Evidently some makers and dealers are short of supplies for prompt delivery, and, in one instance, above 2s. has been paid for immediate delivery. Crystals remain quiet. A limited business is reported in 39-40's at 7⅞d., while 7d. is said to have been accepted for 34-35's. Creosote is still very dull in the North; but London prices are steady, though little or no business is taking place. Some quantity of solvent has been sold in the North at a very low

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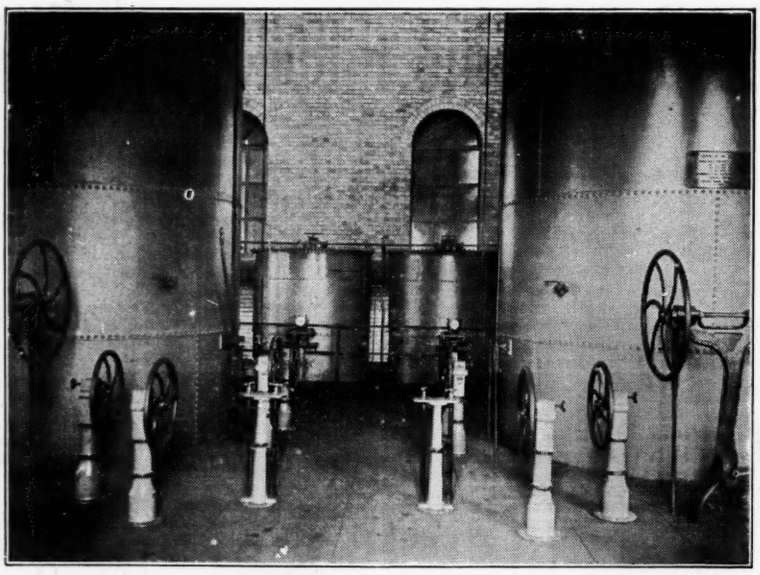


RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One-Fifth Section of Birmingham Plant, Windsor Street Station.

The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 12 MILLION CUBIC FEET.

price, evidently to clear out stock; but there is no demand whatever for export. As regards tar, there is nothing fresh to report.

The average values obtaining during the week are: Tar, 14s. 6d. to 18s. 6d. Pitch, east coast, 31s. to 32s.; west coast, 28s. 6d. to 29s. Benzol, 90's, 9¾d.; 50's, 9¼d. Toluol, 10d. Crude naphtha, 4¼d. Solvent naphtha, 10d. to 11d. Heavy naphtha, 10d. Creosote, ⅞d. to 1⅛d. Heavy oils, 2d. Carbolic acid, 60's, 1s. 10½d. to 1s. 11d. Naphthalene, 60s. to 70s.; salts, 37s. 6d. to 45s. Anthracene, "A," 2¼d. to 2½d.; "B," unsaleable.

Sulphate of Ammonia.—The market remains quiet but steady; and there is a good demand for forward delivery. The Gaslight and Coke Company are reported to have sold for October shipment at £10 15s.; while they have actually realized £10 17s. 6d. for January-March, and do not appear anxious to place any further quantity at this figure. As regards Hull, business has been done at £10 12s. 6d. for the best makes (October shipment); but £10 15s. is still the price for October-December, and this is reported to have been paid in one instance. In Leith business is quiet. One or two sales are reported for prompt at £10 15s.; but the price cannot be taken as over £10 13s. 9d. Liverpool is rather quiet for prompt shipment; but it is difficult to fix the values, although £11 is reported to have been paid.

COAL TRADE REPORTS.

Lancashire Coal Trade.—All the better qualities of round coal continue in fairly active request; but there is still no great pressure of demand, and although collieries are not yet altogether running full time the present output is not more than moving away. Prices remain unchanged from the list rates ruling last month. Common round coals are, perhaps, meeting with rather more demand than of late, both for inland consumption and for shipment; while deliveries to gas companies are also increasing. This is tending to steady prices. At the pit, best Wigan Arley coals average 15s. per ton, Pemberton four feet and seconds Arley 13s. to 13s. 6d., common house coal 11s. to 11s. 6d., with steam and forge coal 8s. 6d. to 9s., and ordinary steam coals (delivered at the ports on the Mersey) 10s. to 10s. 6d. Engine fuel is hanging more on the market; and although in the better qualities Lancashire coal-owners have not much difficulty in disposing of their output, inferior sorts are becoming somewhat of a drug. There is increasing keenness of competition with surplus supplies of slack coming in from outside districts—Derbyshire especially—which is all tending to weaken the market. At the pit, best Lancashire slacks only in exceptional cases average more than 7s. 6d. per ton, with inferior sorts to be bought from 5s. 6d. upwards; while common Derbyshire slacks could be bought from as low as 2s. 6d. Coke continues in good demand, with prices strong. Good Lancashire foundry cokes are steady at 24s. to 25s. per ton at the ovens, good furnace cokes at 14s. 6d. to 15s. Yorkshire good washed furnace cokes at 14s., and unwashed sorts at 13s.

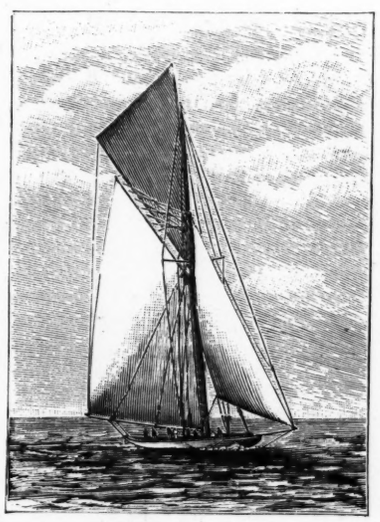
Northern Coal Trade.—The coal trade is steady; and there is an especially strong demand for the best Durham gas coals. In the steam coal trade, the falling off in the demand for the Baltic is now more pronounced, and prices are lower; best Northumbrian steam coals being 12s. 3d. to 12s. 9d. per ton f.o.b., according to quality, while steam smalls are from 5s. to 5s. 3d. The collieries are working fully; but there are not so many forward orders. In the gas coal trade, there is a scarcity of the best classes; and these command very high prices, where occasional cargoes can be had. Up to 12s. 6d. per ton f.o.b. has been paid for such; and the current quotation is near that price. Contracts, however, are running much lower, though those still to be arranged for next year are tending a little upwards. Export coke is steady at 17s. 6d. to 18s. per ton f.o.b.; and blast-furnace coke at about 16s. at the Teesside furnaces. Gas coke is from 12s. 6d. to 13s. per ton; and there seems to be a steady consumption.

Scotch Coal Trade.—There is a slackness in trade which it is difficult to account for, unless it be that nearly all the available output has been contracted for ahead. The mildness of the season is leading to delay in filling cellars for domestic consumption in winter. There is a small demand, and prices are easier. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 136,324 tons—a decrease of 85,241 tons upon the preceding week, and of 118,086 tons upon the corresponding week of last year. For the year to date, the shipments have amounted to 7,109,546 tons—a decrease of 860,892 tons upon the same period of last year.

Torquay Gas Company.—Mr. W. Ball presided on Wednesday at the half-yearly meeting of the Torquay Gas Company, and explained that the absence of Mr. Kitson, the Chairman, was due to an accident which had resulted in the fracture of one of his arms. The accounts showed that, while the half year was begun with a surplus of £446 on the revenue account, it ended with a deficit of £800, after allowing for payment of the usual dividends. A statement prepared by Mr. Kitson, and read by the Chairman, indicated that this position was solely due to the high price of coal. The price of gas was increased last year from 3s. to 3s. 6d. per 1000 cubic feet, but was reduced at Lady-day to 3s. 3d. This reduction was a little premature, for the old coal contract did not expire until Midsummer. The new contract, however, was favourable; and Mr. Kitson's opinion was that the result of the year's working would be found to be satisfactory. In the meantime, there had been an increased expenditure as compared with last year of £2472, and increased receipts of £1225. The difference was a sum of £1247, which was equivalent to 4d. per 1000 cubic feet of gas sold; and this had been given to their customers. Some two or three of the shareholders suggested that it might be wise under the circumstances to pay only a small interim dividend, and await the result of the year's working, to see how the balance stood. It was, however, pointed out that the increased cost was due to the high price of coal in the early part of the year, and that since the reduction in the price of gas the consumption had considerably increased. Under these circumstances, the report was adopted without dissent, and a vote of sympathy with Mr. Kitson was passed.

THE TWO SHAMROCKS.

SIR T. LIPTON'S



SAILS HIGH SEAS.

RICHMOND'S

SEES HIGH SALES.

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Honley Gas-Works Purchase.—The Honley Gas-Works came into the possession of the District Council as from yesterday. The members at their last meeting passed the necessary resolutions to pay for the purchase—viz., that a cheque be drawn on a special gas loan account for £18,500 in payment to the Honley Gas Company, Limited, of the purchase price of the gas-works as per agreement and Act of Parliament; and that a cheque be drawn for the sum of £237 1s. 9d., the balance due to the Company on account of interest on the purchase money.

Uniform but Limited Holidays.—If all our local authorities were to follow in the footsteps of Oldham, municipal service would not be much sought after. A Special Committee on Holidays, consisting of the Chairmen of the various Committees of the Corporation, have determined that holidays shall be uniform in every department, and that they shall be limited to the magnificent period of ten days for each official and clerk. It is not surprising therefore to find that, at a recent meeting of the Gas Committee, Mr. Arthur Andrew, the General Manager of the Department, uttered a protest against the new regulation, which protest he couched in as polite language as he could command. He stated that he considered the proposal an insult to the senior officials and clerks; and very naturally he asked why he should be put on the same footing as a junior clerk in the matter of an annual holiday when during the whole year he never knew when he had done his work. To this very fair inquiry, no satisfactory answer seems to have been forthcoming; but instead the Committee, it is to be regretted, merely affirmed the principle of the proposed new holiday arrangement. Such stiff dealings with officials are not likely to work beneficially; and other local authorities will be ill-advised to copy the example of Oldham.

Additional Capital for the Frimley and Farnborough Water Company.—The shareholders in the Company mentioned were recently called together for the purpose of passing a resolution sanctioning the creation and issue from time to time of a portion of the additional capital authorized by the Company's Order of 1901. The Chairman (Mr. A. C. Pain) said the Provisional Order gave the Company power to raise additional capital, in practically almost any form they pleased, to the amount of £29,000 in new ordinary or preference shares. It was proposed to spend nearly £2000 on plant for softening the supply at Itchell. Then an arrangement had been entered into for the purchase of the share of the Wey Valley Company in the Itchell pumping-station, a rising-main 3 miles in length, and a site for a reservoir; and the Frimley Company would then supply the Wey Company at cost price. The purchase of the Wey Company's share would amount to about £6000. A new well was also being sunk; and this would cost £500; and the cost of the Order and some small items would require something like £250—making altogether £11,000. But it was only proposed to issue £8000 at present; and upon this sum the Directors anticipated a considerable premium. A resolution authorizing the issue of the additional capital, as recommended by the Board, was unanimously carried.

Gas Poisoning in Glasgow.—On the morning of Friday last, Robert M'Cracken, 79 years of age, a cabinet maker, was found dead in bed in his lodgings at 39, Oswald Street, St. Rollox, Glasgow. The gas in the room was turned full on.

Ilkeston and Heanor Water Scheme.—Under the powers obtained by their Act of Parliament last session, the Joint Water Board for Ilkeston and Heanor have acquired 3 million gallons of water per diem from the 18 millions which flow out of the Meerbrook Sough, from under Wirksworth—an ancient sough which relieved the old lead workings in days gone by. The Engineers of the Water Board have been taking levels, &c., and making trial holes near the outlet of the sough, for the purpose of ascertaining the nature of the soil before laying down engines, &c. The contracts will now be let; the expenditure being estimated at £132,000. The sough, it has already been noted, is one of the wonders of the Middle Peak, as it is possible to float a boat in the natural underground lake which exists in the heart of the range of hills above Wirksworth.

Cirencester Water Supply.—A Local Government Board inquiry was held by Mr. Herbert H. Law, M.Inst.C.E., one of the Inspectors, last Tuesday, into an application made by the Cirencester Urban District Council for the issue of a Provisional Order for amending the Cirencester Water Act, so as to enable the Council, now or at any future time, to borrow, with the sanction of the Local Government Board, any sums that may be necessary for maintaining the water supply of the town in an efficient state. The Chairman of the Council (Mr. E. B. Haygarth) explained the necessity for the application. He said that the Council acquired the undertaking of the Water Company in 1897; and, in addition to the purchase money, they borrowed £2000 for the purpose of extending and improving the works. This sum had now been expended, with the exception of £390; and, owing to defects in the plant, and the fact that the rising main to the reservoir is also used for service purposes, it had been found that further works were necessary. These included the construction of a borehole, the provision of new and improved pumping plant, and a new separate rising main to the reservoir, with several other minor alterations and improvements; the whole being estimated to cost £3000. This was the sum which it was proposed to borrow. The details of the scheme were laid before the Inspector by the Surveyor (Mr. T. Hibbert). The only opposition offered was by Mr. Townsend, who contended that a purer and more abundant supply would be obtained from one of two sources—either from the gravel bed or from the Fuller's earth at the Barton Mills. The Inspector pointed out that the latter plan would involve a totally new scheme, and beginning all over again; and Mr. Haygarth added that the deep boring had been resorted to in order to avoid the use of water from the gravel beds, which was open to pollution. Mr. E. Newcombe said that, in addition to the sum expended, the ratepayers were now rated for the deficit in the water accounts, though only one-third of them used it. The Inspector replied that that was their business. This concluded the inquiry; and the Inspector afterwards viewed the site, as is usual in such cases.

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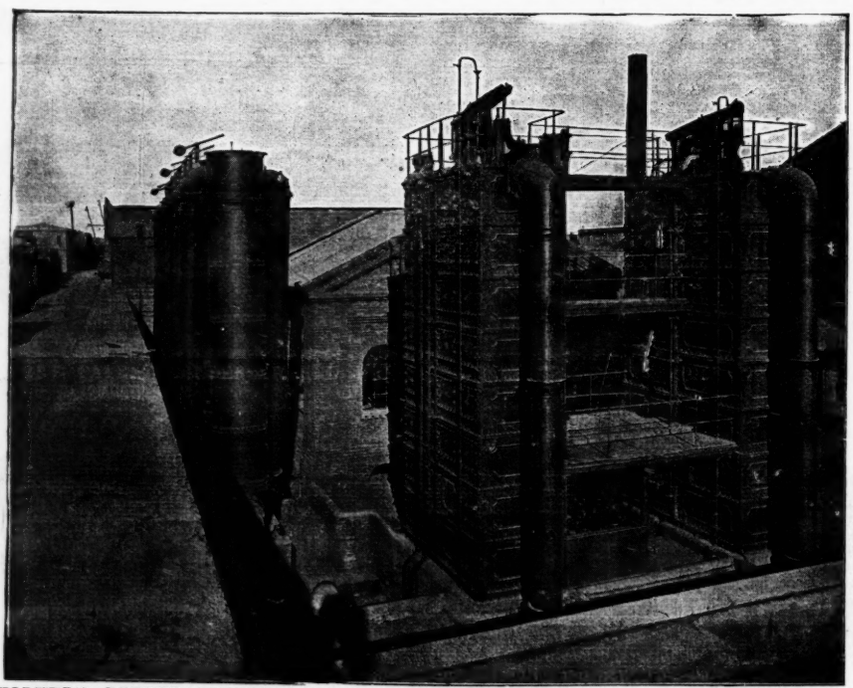

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WALKER'S PATENT CONDENSER AND PURIFYING-MACHINE AT SANTIAGO GAS-WORKS.

Ipswich Water Supply.—At last week's meeting of the Ipswich Town Council, it was decided to accept the tender of Mr. George Bell, of Tottenham, for the construction of the new service reservoir; the figure named being £19,807. It was also resolved to apply to the Local Government Board for leave to borrow a further £20,240 for water-works purposes.

Conisborough Water Supply.—Last Tuesday, Col. W. Langton Coke, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, into an application by the Doncaster Rural District Council for a loan of £5000, to be expended in works for the supply of water to Conisborough. The proposal is to take the water from the Cadeby borehole, 135 yards deep, belonging to the Denaby and Cadeby Collieries. This water, which is organically pure, but possesses 25° of hardness, is at present supplied by the Colliery Company to their own employees. The site of the proposed reservoir (which is to hold 250,000 gallons) is 290 feet above Ordnance datum; and the scheme is intended to supply about 3080 people. The works from which the Colliery Company offer to furnish the water cost over £7000; and the charge proposed is 6d. per 1000 gallons. There is practically an inexhaustible supply; and the pumping machinery is in duplicate. On behalf of the Conisborough Parish Council, a resolution was put in in favour of a supply of Sheffield water from the Doncaster Corporation at 10d. per 1000 gallons; this water possessing only 3° of hardness.

Ilford Gas Company.—The report presented at the half-yearly meeting of this Company on the 19th ult., stated that the increase in the sales of gas represented 18 per cent. when compared with the corresponding period of last year. In addition to the falling off experienced in the price of residuals, the dearness of coal materially increased the cost of production. More favourable coal contracts have, however, been obtained for the ensuing year. In view of these contracts and the continued increase in the Company's business, the Board have reduced the price of gas from 3s. 10d. to 3s. 6d. per 1000 cubic feet from the Midsummer quarter—this being the price charged before the recent abnormal rise in coal. The profit and loss account showed a balance of £5647 available for dividend. Out of this sum, the Directors recommended the payment of dividends at the rate of 6 per cent. per annum on the "A" and "C" stocks, and 4½ per cent. per annum on the "B" stock, less income-tax. The Chairman (Mr. William Ashmole), in moving the adoption of the report, said that, in common with all other gas companies throughout the kingdom, they had not this half year so satisfactory a balance-sheet. They were, however, in a position to pay the usual dividends, and carry forward a good balance. The Company had received £1600 less for residuals than in the previous half year. The new gasholder, which reflected great credit on its designer (their Engineer and Manager, Mr. J. H. Brown), had at last been completed. The report was adopted, and the dividends declared. An extraordinary general meeting was afterwards held, at which the Directors were authorized to raise not exceeding £50,000 by ordinary stock, and £33,333 by 4 per cent. perpetual debenture stock, to meet the continually increasing demands in the district.

Accident at the Middlesbrough Gas-Works.—An accident occurred at the Middlesbrough Gas-Works, yesterday week, by which two workmen were seriously injured. A new retort-house is being erected, the contract being in the hands of Messrs. Ashmore, Benson, Pease, and Co., Limited. A gang of the workmen was engaged hoisting into position a pipe weighing 15 cwt., when the chain snapped, and two Middlesbrough men named Dawson and Liddell were crushed by the falling pipe. Dawson was seriously injured about the lower part of the body—difficulty being experienced in extricating him—and Liddell sustained similar injuries. Both were taken to the infirmary, and Liddell died there. An inquest on the body was opened on Thursday, and adjourned for the attendance of the Factory Inspector.

East London Water-Works Company.—In the report to be presented at the meeting of the Company on Thursday, the Directors state that the revenue from all sources for the six months to Midsummer was £191,547, or an increase of £8567 over the corresponding period of the previous year; while the expenditure has been £90,180, as against £82,409. The increase of water-rates amounted to £9684. There were 3594 new services laid on during the half year; making the total number now 213,943. The Directors recommend the payment of a dividend on the ordinary stock at the rate of 7 per cent. per annum for the half year, less income-tax. This will absorb £60,219, and leave an unappropriated balance of £29,639 to carry forward. It is pointed out, however, that this balance will be materially drawn upon owing to the necessity of purchasing in the current half year large quantities of emergency water from the New River and the Thames Companies, by reason of the prolonged and persistent drought. This assistance has enabled the Company to keep up the constant high-pressure supply during the whole period of the drought.

Exmouth Gas Company.—The report presented by the Directors at the half-yearly meeting of this Company last Tuesday stated that the revenue for the six months to June 30 was £4011, and the expenditure £3703, leaving a balance of £308 to be carried to the profit and loss account. It has been decided to reduce the price of gas 2d. per 1000 feet from the date of recording the meter indices for the Michaelmas quarter. Additional capital to the amount of £3000 is to be raised, to pay for new mains and services required. The report having been adopted, Mr. H. A. Willey drew attention to the enormous leakage of gas which was taking place throughout the town, apparently owing to the drainage operations. It was estimated that the amount of gas so lost was an equivalent of 1s. per 1000 cubic feet upon the quantity sold. He thought the time had arrived for companies to employ much cheaper coals, producing a gas of lower illuminating power. It had been proved that 10 or 12 candle gas was ample for the purposes of energy and incandescent lighting. Such a policy would have the effect of educating the public to employ more economical methods, whereby gas as an illuminant enters into successful competition with electricity and other agents; and it would also result in a reduction in the price of gas all round. It was unanimously agreed to raise the Secretary's salary to £200 per annum.

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A Mild Exaggeration.—The "Devon and Exeter Gazette" recently contained the following: "The lighting of Paris is a work of great magnitude. There are no fewer than 50,000 lamps; and it takes 6000 men to attend to them. The cleaning alone occupies no fewer than 3753 men; and the cost of this army of lamplighters, cleaners, and attendants is nearly £5,000,000 sterling a year." Where these figures originally came from is a mystery; but the last one is certainly a staggerer. Some authentic figures are given in the "JOURNAL" for May 21, p. 1376-77; and from these it appears that in 1898 the total gas and maintenance charges for the public lighting of the whole city was only about 5,500,000 francs—about £218,000.

Barry Gas and Water Supply.—The Barry Finance Committee, who met last Tuesday evening (under the presidency of Councillor E. B. Smith-Jones) for the purpose of considering the estimates for the ensuing half year, were informed by the Clerk that the Council were getting much nearer a credit balance than for some time past. It was pointed out that there was an actual loss for the six months on the gas and water undertaking of £1600; and provision was made to liquidate £1000 of this during the coming six months. Mr. C. B. Brown, Chief Accountant of the Gas and Water Department, said that the gas-works paid £2500 every year towards the rates; and the Clerk expressed the opinion that, if sold in the open market, the concern would pay all the debts of the Council. The Chairman, however, declared that, in view of the enormous deficiency on the water-works, the seriousness and responsibility of the position ought to be grasped by the Gas and Water Committee, and some action taken in reference to it.

Alleged Discrepancies at the Leek Gas-Works.—The charge as to a discrepancy in the residuals account of the Leek District Council Gas Department has ended in a fizzle. The Gas Committee at the last meeting reported that they had gone thoroughly into the matter of the alleged discrepancy in the gas residuals account, "on which some members of the Council, without sufficient knowledge, and on a wrong basis, have made misleading calculations, besides wild and alarming statements, thus unsettling the public mind and casting suspicion on the honesty of the manner in which the work of the department is carried on." The figures given showed an equal increase at the rate of almost 4·6 per cent. per annum for the last ten years in coal carbonized, tar produced, and sulphate of ammonia made. The result of the inquiries made by the Committee was that, instead of a deficiency, all the residuals showed a steady corresponding growth with the coal carbonized, and worked out much better than could be expected from the usual computation of 100 lbs. of tar and 12¾ lbs. of sulphate of ammonia from a ton of coal, showing increases in tar of 344 tons and in sulphate of ammonia of 37 tons. The Committee stated that they had come to the conclusion that matters at the works were not, as had been pictured, in a "deplorable state," but, on the contrary, were in a sound and prosperous condition. A long discussion took place upon the matter, in which two members severely criticized the report. An effort was made to obtain the appointment of a firm of accountants to examine the books and records; but the motion was rejected.

Poisoned by Gas.—James Wilkie, aged 50 years, of Monkwearmouth, Sunderland, was discovered dead in bed yesterday week. It was found that a plug had been removed from the end of a gas-pipe; and the apartment was full of gas. There seems to be little doubt that the removal of the plug was intentional.

Wivenhoe Water Supply.—The question of a water supply for Wivenhoe has been a source of great trouble to the Urban District Council; but, with the aid of Messrs. Sands and Walker, a satisfactory scheme has been adopted. This comprises a borehole 130 feet deep, which yields 9000 gallons of excellent water per hour. The boring is situated in the lower portion of the town; and the water is to be pumped direct to a tower 55 feet high, which will be surmounted by a tank having a capacity of 50,000 gallons. The total cost of the scheme will be £6500. Last Tuesday witnessed the laying of the foundation stone of the tower, by Mrs. Barlow, the wife of the Chairman of the Council; the trowel and mallet used by her for the ceremony being presented by the Engineers.

Proposed Extension of the New Mills Gas-Works.—An inquiry was held at New Mills last week by Col. W. Langton Coke, M.Inst.C.E., on behalf of the Local Government Board, into the application of the Urban District Council to borrow £2500 for improvements required at the gas-works. There was no opposition. The Clerk to the Council (Mr. Joseph Pollitt) explained that the late Local Board purchased the gas-works about ten years ago from the New Mills and Hayfield Gas Company, at a cost of £11,000, and close upon £5000 had since been expended on them. Other improvements were, however, needed. Mr. Cochrane, the Chairman of the Gas Committee, said it was proposed to go in for improvements costing £6000. The Inspector said his report would be prepared and despatched as early as possible.

Sadler and Company, Limited.—The annual meeting of the shareholders of this joint-stock concern was held yesterday week at Middlesbrough—the Chairman, Colonel Sadler, M.P., presiding. In submitting the report and balance-sheet for confirmation, he said that during the past year the profits (had it not been for the collapse of some of the Company's products in December) would probably have amounted to £30,000. Compared with other undertakings of a similar character throughout the country, he considered the Company's results were, on the whole, satisfactory. As to the probable course of business in the ensuing year, he thought there was an encouraging outlook for most of the Company's products—more especially as they had secured their raw materials at a price which was practically £20,000 less than the previous year. Since the Company had started, they had distributed £77,000 in dividends, £89,000 in interest on debentures, had spent £60,000 on their works in renewals, and written off £20,000 for depreciation. He found his engagements were now so numerous and pressing that he had been obliged to relinquish his position as Managing Director of the Company, but was willing to continue as an ordinary Director and Chairman. The report and balance-sheet were confirmed; and a dividend of 5s. per share was ordered to be paid. Regret was expressed at the retirement of Colonel Sadler; and he was unanimously elected a Director and Chairman of the Company.

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Brisbane Gas Company.—The half-yearly meeting of the shareholders was held on Aug. 2. The statement of accounts showed a net amount to the credit of profit and loss (including the balance from the last half year) of £10,287. A dividend of 5 per cent. was declared, amounting to £6995; and the dividend tax absorbed £350—leaving to be carried forward £2942. During the half year considerable further extensions had been made, the Directors reported. The slot-meter system was successfully introduced in March, and the demand for prepayment meters was steadily increasing.

Dorking Gas Company.—The report of the Directors which was adopted at the recent meeting of this Company stated that, after providing for the interest on the debenture stock, there was a balance available for dividend of £2173. The Directors recommended the payment of maximum dividends on all classes of shares, which would absorb the sum of £1237, and leave £936 to be carried forward. The sale of gas to private consumers had increased by 9·62 per cent. The Bill promoted by the Company in the last session of Parliament passed without opposition. The contract for coal for the Company's requirements to March next had been made at a satisfactory reduction on last year's prices, although considerably higher than those ruling in 1898 and 1899; but the Directors felt they were justified in making a reduction of 3d. per 1000 cubic feet in the price of gas as from June last.

The Investigation into the Affairs of the Welsbach Company.—Many of the shareholders of the Welsbach Company are evidently anxious to obtain intelligence as to what the "Advisory Committee" are doing who were appointed at the last meeting; for we learn from a letter by the Secretary to the Committee that "several inquiries" have been made in regard thereto. His response to them is as follows: "I am authorized to state that the Committee appointed at the general meeting on June 27, 1901, has been closely engaged in an examination of the affairs of the Company and the conditions affecting its business, and of the manner in which such business is conducted. In the course of their deliberations, it has been found necessary or desirable to examine a great mass of documents and accounts; and in this work the Committee are being assisted by the Hon. Charles Russell, who has been appointed Solicitor to the Committee, and by Mr. W. W. Wright, Chartered Accountant, who has been appointed Secretary to the Committee. The Committee have also examined Directors and others with reference to the affairs of the Company; and the Chairman of the Committee, the Hon. Philip Stanhope, has visited Vienna, and has reported to his colleagues on the subject of the relations with the Austrian Company. In consequence of the large amount of detail still to be dealt with, and of the difficult and important questions to be considered in connection with the future constitution and administration of the Company, a considerable time must necessarily elapse before the labours of the Committee are completed, and they are in a position to submit their recommendations to the shareholders. In the meantime, the proprietors may rest assured that the Committee are sparing no effort in the fulfilment of the onerous task which has been entrusted to them."

Price of Gas at Leeds.—A resolution will be proposed by Mr. Jessop, at the meeting of the Leeds City Council to-morrow, instructing the Gas Committee to consider the advisability of reducing the price of gas 2d. per 1000 cubic feet.

Halifax Coal Contracts.—The Halifax Corporation Gas Committee have let the contracts for their forthcoming coal requirements. The amount wanted is 16,000 tons; and to supply this, they received no less than 35 tenders. The contracts entered into work out to an average price of 10s. 9d. a ton. Compared with the average price paid last year, there will be a saving of nearly £2600.

Incandescent Trust, Limited.—Not long since we made somewhat extended reference to this organization; and it may very possibly be remembered that the intention of the promoters was to form a combination whose duty it would be to defend actions brought against the members, or shareholders, in connection with the Welsbach 1893 patent. So far, the idea does not seem to have "taken on" with that freedom which was anticipated at the meeting from which the Trust floated. There have been rumours that, before anything of real worth has been done, there have been dissensions in the camp; and the report which was presented at the statutory meeting of the Company yesterday, at the Cannon Street Hotel, seems to lend some colour to these whisperings. We learn that the total number of shares allotted is 1413; and these shares were allotted "on the footing" that they were to be paid up in cash—5s. on application, and similar amounts respectively on allotment, on first call, and on second call. "The footing" does not appear to have been respected in all cases; seeing that, of the number of shares mentioned, 285 have been allotted upon which "no money has been paid." The total amount of cash received by the Company up to Sept. 18 in respect of the other shares is £631 15s. The preliminary expenses for registration, legal charges, advertising, &c., amount to £371 6s.; so that when this sum is paid, only £260 9s. will remain. This, we fancy will be barely sufficient to meet current expenses, let alone giving anything towards a reserve for fighting purposes. Looking into the figures a little closer, it would appear that those who have paid the amounts on application and allotment have not all met the first call—if made. Of course, if a call has not yet been made, it may be that the difference between £564 (10s. on 1128 shares) and £631 15s. is money paid in respect of the first call previous to its being made. To say the least, without further explanation, the figures are a little mystifying. It seems a curious procedure, for instance, to have allotted 285 shares on which "no money has been paid," inasmuch as the terms were that 5s. should be paid on application. It is mentioned in the report that the Directors are Messrs. W. Lowen, F. Edge, and S. J. Mellor; and that Messrs. Harper Bros. are the Auditors. As will have been observed, the statutory meeting of the members was held yesterday; but none but subscribers were allowed in the room—two stalwart commissionaires refusing entry even to representatives of the Press. Under these circumstances, we are unable to give an account of what took place at the meeting, which might have put a better complexion on a report which does not strike one as being of an exhilarating character.

New and Artistic Designs in GAS FIRES.

"THE LAMBETH"

No. 1022.

PRICE - - £6 10s.

"THE LAMBETH" is made as an Independent Stove (as shown), or as an Interior Gas Fire for building into Tile Fireplaces.

It can also be fitted with Coloured Glass Wings to prevent side draught, 15s. extra.

R. & A. MAIN, LIMITED,

LONDON, GLASGOW, MANCHESTER, BIRMINGHAM, & BRISTOL.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

TERMS OF SUBSCRIPTION to the "JOURNAL."

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance. If credit is taken, the charge is 25s. a year.

Telegraphic Address: "GASKING, LONDON."
Telephone Number: Holborn 121.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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Telegrams: "LUMINOSITY."

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JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
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TO GAS AND WATER OFFICIALS.
HIGH-CLASS CYCLES at Reasonable and LOW PRICES. Guaranteed and sent on approval. For Cash or Gradual Payments. Catalogue post free. Old Machines Exchanged or Repaired.
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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
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CONTRACTS are undertaken by William EDGAR for FITTING UP HOUSES, complete with the PENNY-IN-THE-SLOT INSTALLATIONS. Gas Companies or Corporations indemnified against loss through Accidents, &c. Thousands of Houses have been fitted up by me under this System. Estimates free.
BLENHEIM HOUSE, 23, Lower Mall, HAMMERSMITH.
Telegrams: "Gasoso."
Telephone No. 14 Hammersmith.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

TO ENGINEERS AND MANAGERS.

NOTICE IS HEREBY GIVEN.

IT is recorded in the "Book of Experience" at Smethwick that it does not require a Gas Engineer to be a man of patient habits of observation, or superabundantly endowed with the power of comparison, to grasp the distinctions between a Conveyor that "Carries" the Coke and Conveyors that "drag," "scrape," or "push" coke; and it is likewise recorded in the said book, which is open for inspection at Smethwick, that the Gas Engineer who does not yet see the advantages of the Hot-Coke Conveyor that "Carries" the Coke, over Conveyors that "trail," "drag," or "scrape" coke, must be a man gifted with negligent habits of observation, and not entitled to an advance in his salary from his Committee or Directors.

Applications for Drawings, Specifications, and Tenders for the Hot-Coke Conveyor that "Carries" the coke should be addressed to me the minute the Gas Engineer recommends his Committee or Directors to make a further reduction in the carbonizing wages.

GILBERT LITTLE,
Managing Director.
Transport Appliance Works,
Smethwick.

GAS-WORKS FOREMAN (No. 3742).

THE numerous Applicants are thanked FOR REPLIES to Advertisement, and informed that the vacancy is NOW FILLED.

TWO Fitters (ages 24) require employment. Nine Years' experience. Iron and Compo. Excellent References.
A. A., 10, Lebanon Street, WALWORTH.

RETORT Setter and General Bricklayer required. Constant Employment to experienced and steady Man.
Apply, stating Wages required, with *Copies* of Three Testimonials, to the ENGINEER, Gas-Works, Gravesend, KENT.

WANTED, a smart, intelligent Young Man as SHOW-ROOM MANAGER. Previous experience indispensable.
Applications, accompanied by *copies* of three recent Testimonials, stating Age, Experience, and Salary required, to J. H. BROWN, Gas-Works, ILFORD.

AN Engineer of a Gas-Works in Yorkshire, making nearly 100 million cubic feet per annum, has a vacancy for an ARTICLED PUPIL. Premium required.
Further Particulars on application to No. 3748, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for Cape Town, several WORKING CARBONIZING FOREMEN. Must understand Furnaces, Engines, and Exhausters. Wages £3 per week (passage paid).
Apply, by letter, stating Qualifications, to CAPE TOWN GAS COMPANY, 35, New Broad Street, LONDON, E.C.

WANTED, a young Man with good Technical Training as FOREMAN for a Gas-Works in South America. One preferred capable of taking entire charge of small Gas-Works if required.
State Qualifications, Age, and Salary required, to No. 3749, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SERVICE Layer Wanted. One who can fix and read Meters, and repair Mains preferred. Medium sized Works within 40 miles of Birmingham. Character of Applicants must bear strictest investigation.
State, by letter, Age, Wages required, and Particulars of previous engagements, enclosing *copies only* of Testimonials, to No. 3752, **care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

OXIDE OF IRON OF FINEST QUALITY.
BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.
Send for full Particulars to
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Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

WANTED, Employment as Inspector of Meters, Mains, and Gas-Fitters' work. Well up in Incandescent Lighting, Gas-Cookers, and Heating Stoves. Willing to make himself generally useful on a Gas-Works or in the Workshops. Has had large experience.
Address No. 3739, **care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

GAS MANUFACTURE EXAMINATIONS.

CORRESPONDENCE CLASSES. Young Gentlemen coached in Modern Gas Making and prepared for the City and Guilds Examination (Ordinary or Honours Grade), by an experienced Teacher. Successes: Five Seasons, Four Medals; last Season's Classes, 100 per cent. passed, nearly 60 per cent. first-class. Confidential.
For Terms, Particulars, &c., apply, by letter, to No. 3728, **care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

GLYNCORRWG URBAN DISTRICT COUNCIL.

WORKING MANAGER FOR THE GAS-WORKS.

THE above Council invite applications for the post of WORKING MANAGER for their Gas Undertaking. Salary 30s. per week, with House, Coal, and Gas.
Applications, stating Age, Qualifications, and past Experience, together with *copies* of three recent Testimonials, to be sent to the undersigned, not later than the 2nd of October.

CUTHBERTSON AND POWELL,
Clerks.
Water Street, Neath.

FOR SALE—Round Station Meter, in splendid condition, with 6-inch inlet, and 6-inch outlet. Capacity, 3000 cubic feet per hour.
Apply, FRODINGHAM IRON AND STEEL COMPANY, near DONCASTER.

OFFERS are invited for the purchase of 25 to 30 Tons of CARBON, f.o.r., Tongham Station, London and South-Western Railway.
Quotations to the SECRETARY, Aldershot Gas and Water Company, ALDERSHOT.

RETORT Setter and General Bricklayer wanted at a medium sized works within 30 miles of Birmingham; a young man with a good knowledge of Winstanley's and Klönne settings.
State Age, previous Employment, Wage required, and enclosing *copies* only of Testimonials, to No. 3740, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—
GASHOLDER (with Wrought-Iron Tank), 30 ft. by 12 ft. Cable Guided. New in 1895.
CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.
Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.
Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

CORPORATION OF BANGOR.

THE Lighting Committee are prepared to receive TENDERS for their surplus TAR (about 300 Tons per annum) for One, Two, or Three Years.
Tenders, addressed to the Chairman, to be sent to the undersigned, on or before Oct. 22, 1901.

JOHN SMITH,
Gas Manager.

ROYAL MASONIC INSTITUTION FOR BOYS.

ELECTION OF TWENTY BOYS FROM A LIST OF FORTY-SEVEN CANDIDATES.

FRIDAY, the 11th of OCTOBER, 1901.

VOTES TO SECURE THE ELECTION OF
WILFRED ALGERNON BURFIELD

WILL be thankfully received by the Secretary of the Evening Star Lodge, No. 1719, Bro. Walter T. Dunn, 47, Fentiman Road, London, S.W., or they may be sent to the Office of the "JOURNAL."

Special attention may be drawn to the following paragraph on the subject, which appeared in the "JOURNAL" for Sept. 10: When subscribers to the Royal Masonic Institution for Boys receive their balloting papers for the October election, they will find the name of Wilfred Algernon Burfield among the accepted candidates. This is the only son of the late Bro. F. G. Burfield, Assistant Secretary of the Tunbridge Wells Gas Company, and previously Secretary to the Gas Institute, who was initiated in the Evening Star Lodge, No. 1719, in June, 1894, and remained a Subscribing Member until his death in December, 1899. His widow, who suffers from an affection of the eyes, is left in such poor circumstances that the Evening Star Lodge have taken up the candidature of her child, to assist in his election into the Institution. The case is strongly recommended.

It may be added that the Candidature is receiving good support; but as it is earnestly desired to secure the election at the first attempt, and about 4500 votes will be required, an urgent appeal is made for assistance.

SOUTHWARK AND VAUXHALL WATER COMPANY.

TENDERS FOR THE SUPPLY OF 36-INCH CAST-IRON PIPES.

THE Directors are prepared to receive TENDERS for the supply of 15,000 Tons (more or less) of 36-inch CAST-IRON PIPES and SPECIAL CASTINGS.

Specification and Form of Tender may be obtained at the Company's Office upon payment of £1, which will be refunded on receipt of a *bonâ-fide* Tender.

Tenders, addressed to the Chairman and Directors, Southwark and Vauxhall Water Company, Southwark Bridge Road, London, S.E., must be sent in on or before Monday, the 7th inst, endorsed "Tender for Pipes."

The Directors do not bind themselves to accept the lowest or any Tender.

TENDERS FOR NEW WORKS.

THE Directors of the Slough Gas and Coke Company invite TENDERS for the erection of NEW WORKS at Upton Lea, Slough.

Plans and Specifications may be had on application to Mr. Thomas Webb, Engineer and Manager, on payment of £3, which will be returned on receipt of a *bonâ-fide* Tender.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, addressed "R. Martin, Esq., Chairman, Castle View, Chalvey, Slough," and endorsed "Tender for New Gas-Works," to be delivered not later than Tuesday, the 15th of October next.

By order of the Directors,
ARTHUR THOMAS,
Secretary.

High Street, Slough,
Sept. 19, 1901.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF ORDINARY STOCK.

THE Directors have instructed Mr. ROBERT MACK to SELL BY AUCTION, at the Offices of the Company, Newcastle-upon-Tyne, on Wednesday, the 16th day of October, 1901, at Twelve o'clock at noon,

FORTY THOUSAND POUNDS ORDINARY STOCK of the Company, to be issued under the Powers of the Company's Act of 1896.

For Conditions of Sale and further Particulars, apply to the undersigned,

THOS. WADDOM,
Secretary.

Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, Sept. 25, 1901.

DOVER GAS COMPANY.

IMPORTANT ISSUE OF £10,000 OF NEW STOCK,
UNDER THE PROVISIONS OF THE DOVER GAS ACT, 1901.

MESSRS. WORSFOLD & HAYWARD are favoured with Instructions from the Directors to SELL BY AUCTION, at the Metropole Hotel, Dover, on Thursday, the 17th of October, 1901, at Three o'clock p.m. precisely, in convenient Lots,

£10,000 OF NEW ORDINARY STOCK
IN THE
DOVER GAS COMPANY.

This Stock is in all respects equal to the existing Stock and Shares, which have paid the full Parliamentary Dividend of 7½ per cent. since 1874.

The present price of gas is 2s. 11d. per 1000 cubic feet, whereas the price authorized by the Company's Act is 5s. 3d.; thus giving ample security for the payment of the full Dividend on the increased Capital, apart from the increasing consumption.

Particulars, with Conditions of Sale, may be obtained of the Secretary of the Company, Mr. GEORGE FIELDING, Solicitor, 14, Snargate Street, DOVER; at the COMPANY'S OFFICES, Russell Street, DOVER; and of Messrs. WORSFOLD AND HAYWARD, Auctioneers, Surveyors, and Estate Agents, DOVER, and 80, Cannon Street, LONDON, E.C.

RAMSGATE CORPORATION.
(WATER DEPARTMENT.)

TENDERS invited for from 450 to 500 18-inch WATER-PIPES.

Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, not later than Ten a.m. on Monday, Oct. 21, endorsed "Tender for Pipes."

The Committee do not bind themselves to accept the lowest or any Tender.

Specification and full Particulars on application to
WILLIAM A. M'INTOSH VALON,
Engineer.

SURPLUS COKE.

TO CEMENT MAKERS AND OTHERS.

THE Directors of the Isle of Thanet Gaslight and Coke Company are prepared to receive TENDERS for the whole of the surplus COKE produced at their works, from the 1st of October, 1901, to the 30th of September, 1902.

The quantity will be about 5000 tons, more or less. Offers to be either f.o.r. or f.o.b. Margate (in the latter case the buyer paying the dues, 7d. per ton), or as the Coke lies on the Company's Works.

Tenders to be addressed to the Chairman of the Company, and to be delivered at the Offices of the Company not later than Thursday, Oct. 3, 1901.

Any further Particulars required may be obtained on application to the Company's Engineer, Mr. James Dougall.

By order,
THOS. C. FULLER, F.I.S.,
Secretary.

Company's Offices, The Dane,
Margate, Sept. 20, 1901.

COUNTY BOROUGH OF STOCKPORT.
(GAS AND ELECTRICITY DEPARTMENT.)

TO ENGINEERS.

THE Gas and Electricity Committee are prepared to receive TENDERS for the erection of WATER-TUBE CONDENSERS at their Portwood Gas Station.

Plans, Specifications, and full Particulars can be obtained on application to the Engineer, Mr. S. Meunier, on payment of £1 1s., which is returnable on the receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Condensers," must be addressed to the Chairman of the Gas and Electricity Department, on or before the 15th of October next ensuing.

No Tender will be accepted without satisfactory proof that the firm tendering pays the Standard Rate of Wages, and observes the Standard Number of Hours.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
ROBERT HYDE,
Town Clerk.

Sept. 27, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

£10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PINNER GAS COMPANY, LIMITED.

400 £5 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 500 ORDINARY £10 SHARES
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

1000 £10 NEW ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By EDWIN FOX and BOUSFIELD,
At the Auction Mart,
On Wednesday, Oct. 16, at Two o'clock, in Lots.

By order of the Directors, and pursuant to the Auction Clauses of the Company's Act of 1899.

WOKING WATER AND GAS COMPANY.

£20,000 NEW CAPITAL, in 2000 £10 ORDINARY SHARES, in Lots of Ten Shares each.

THE Shares form part of an authorized issue of £120,000, have the same powers and privileges, and rank *pari passu* with the existing Capital, now paying a Dividend of £4½ per cent. per annum, and are entitled to a dividend not exceeding £7 per cent. per annum; thus offering a thoroughly sound and improving Investment.

Particulars of the SECRETARY at the Company's Office, 5 and 6, Great Winchester Street, E.C.; at Messrs. EDWIN FOX and BOUSFIELD'S Office, 99, Gresham Street, Bank, E.C.; and of the Company's Solicitors, Messrs. CHARLES A. BANNISTER and REYNOLDS, 70, Basinghall Street, E.C.

BATTERSEA POLYTECHNIC.

Principal, SIDNEY H. WELLS,
Wh.Sc., A.M.Inst.C.E., A.M.Inst.M.E.

GAS MANUFACTURE.

MR. J. G. TAPLAY (Gaslight and Coke Company), Ordinary and Honours courses—Lectures and Laboratory work—on Wednesday and Thursday evenings respectively. Fees per Session: Members 7s. 6d., Non-Members 8s. 6d.

Abridged Prospectus free on application. Detailed Prospectus 1d., post free, 3d.

Just Published.

AN IMPORTANT NEW BOOK FOR GAS MANAGERS, GAS-FITTERS, &c.

Large Crown 8vo. Cloth. Price **5s.** *net. Post Free.*

PRACTICAL GAS FITTING:

A Handbook relating to the Distribution of Gas in Service Pipes, the Use of Coal Gas, and the best means of Economizing Gas from Main to Burner.

By WALTER GRAFTON, F.C.S.,
Lecturer on Gas Manufacture, &c., at the Polytechnic Institute, Regent Street, and of the Gaslight and Coke Company, London.

CONTAINING 330 PAGES & 143 ILLUSTRATIONS.

The Engineer and Manager of one of the leading Provincial Gas Companies writes: "After a careful perusal I have come to the conclusion that, from a practical point of view, Mr. Grafton's work is one of the best that I have had the pleasure of knowing in recent years, and is in every respect a very desirable adjunct to a Manager's or an Assistant's Library."

The Gas World says: "Mr. Grafton has produced a fairly complete and comprehensive treatise . . . We have no hesitation in recommending all our readers who are interested in gas-fitting work not merely to buy a copy of his book, but to read it."

The Journal of Gas Lighting says: "Mr. Grafton has well covered his ground."

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GAS ENGINEERS' AGENTS AND CONTRACTORS FOR Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.

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CANDLE SAFETY LAMPS

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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WELLINGTON MILLS
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Asbestos Spinners and Manufacturers.

Telephone No. 950. Tels.: "ASBESTOS, BRADFORD."

If you want a FRICTIONLESS PACKING, order the Original "CRESSWELL'S."

It is cheaper in First Cost, and better than Imitations. Ask for No. 1 Catalogue.

Applications for Colonial and Foreign Agencies desired.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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"BEACON" GLOBE LAMP.

Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.

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Telephone: 2669 AVENUE. Telegrams: "LUMINOSITY."

NITRATE of Thorium and Cerium,
FABRIK CHEMISCHER PRAEPARATE VON STHAMER NOACK, AND CO., HAMBURG.

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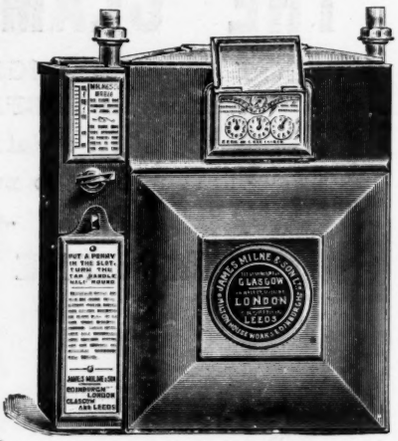

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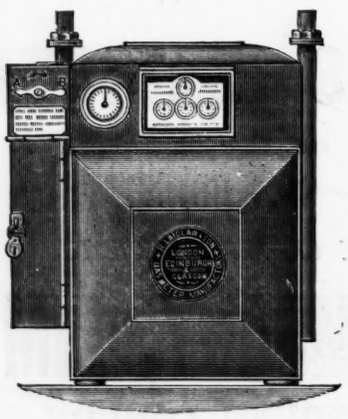

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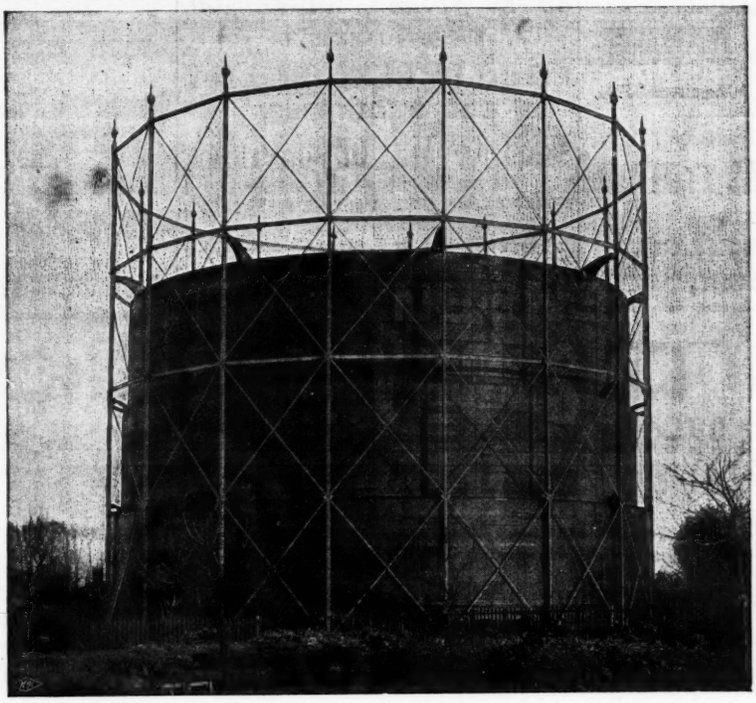
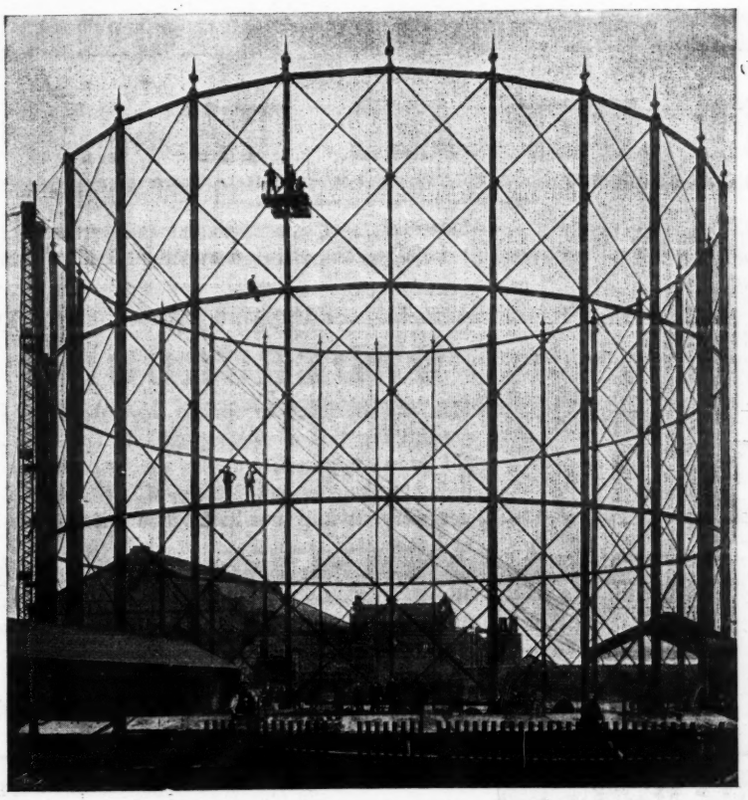


Three Lift Gasholder and Steel Tank, 90 feet diameter by 14 feet deep, recently erected for the EPSOM GAS COMPANY.



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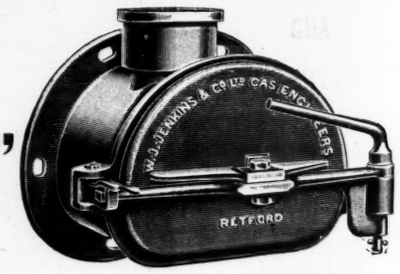

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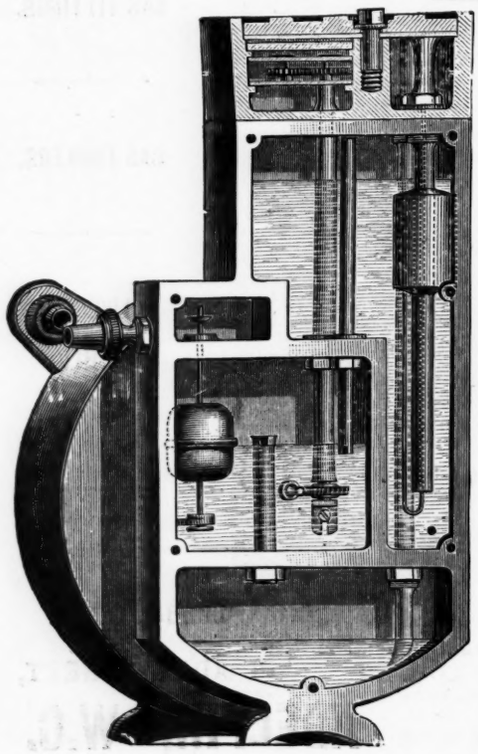

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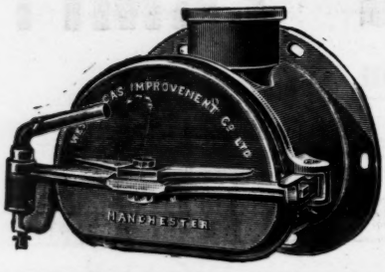

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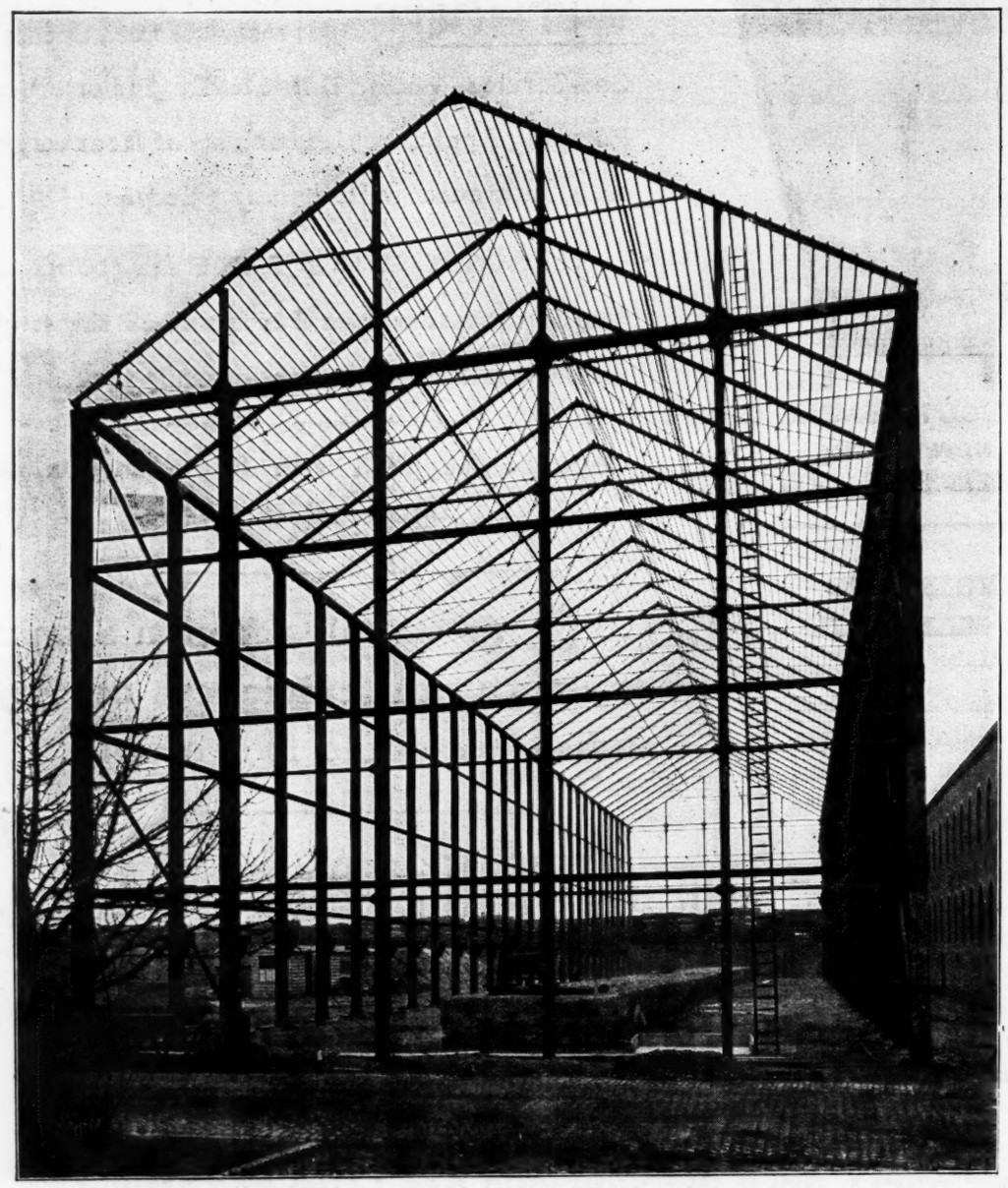

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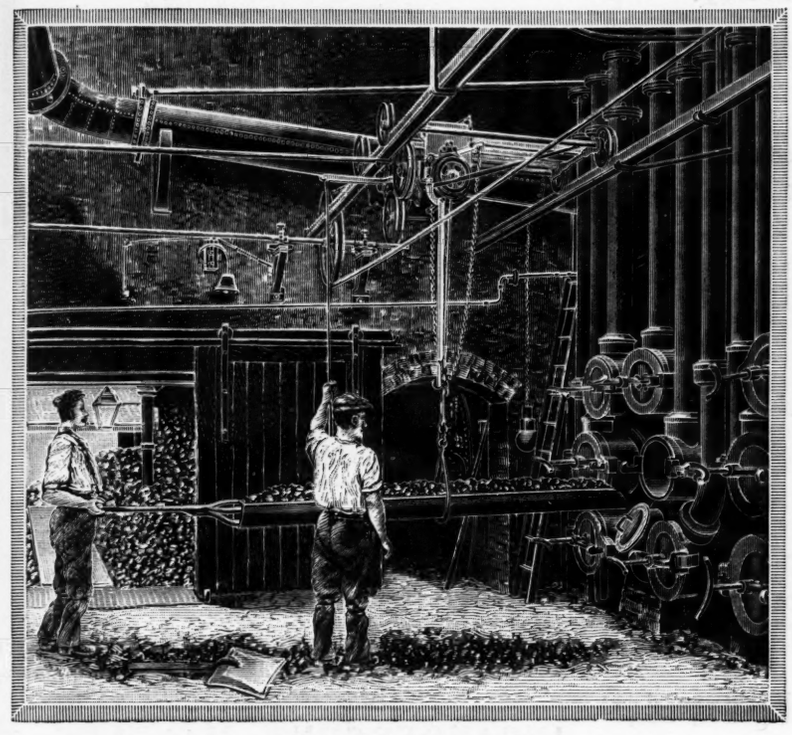

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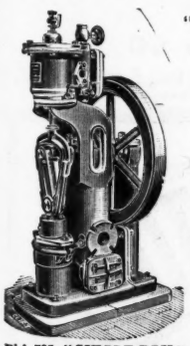

Fig. 705. "SINGLE RAM" STEAM-PUMP.

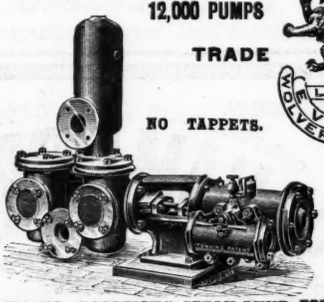

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

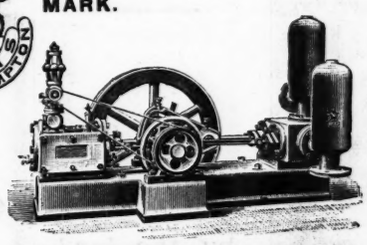

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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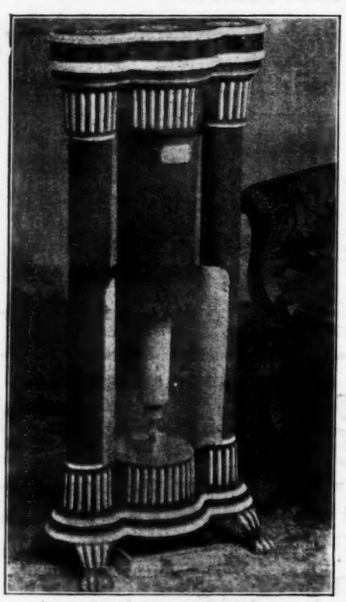

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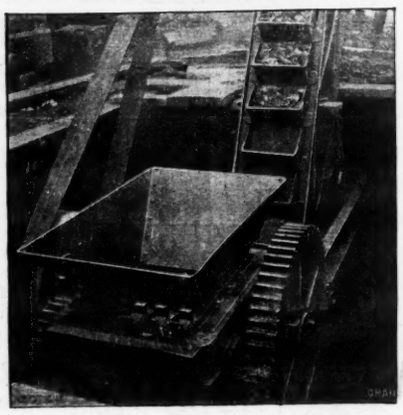

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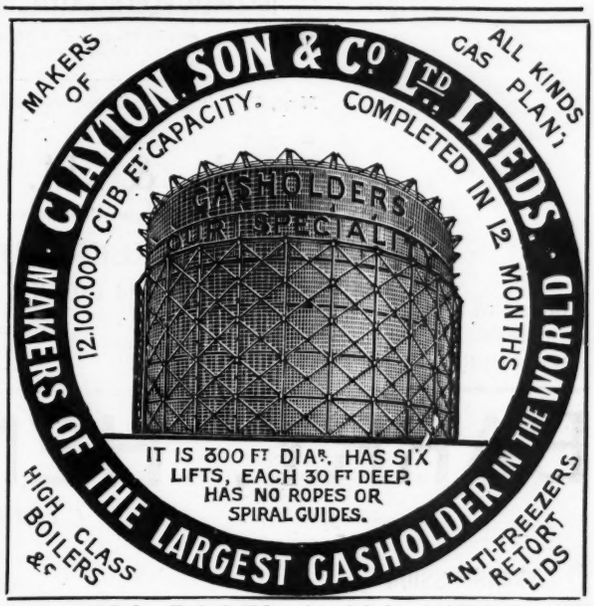
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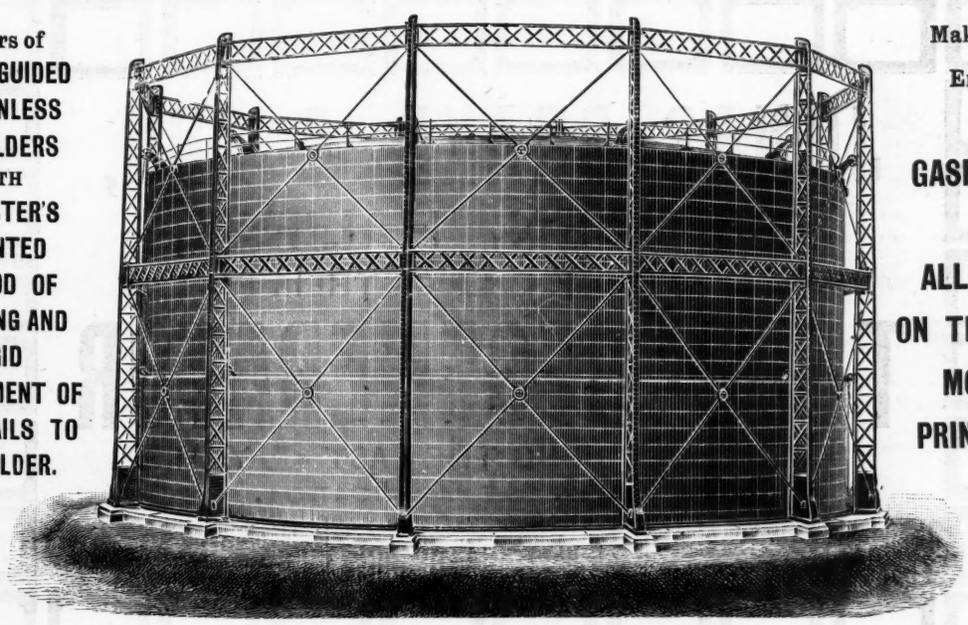

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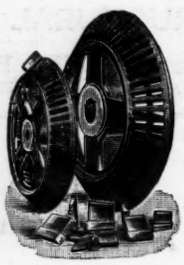

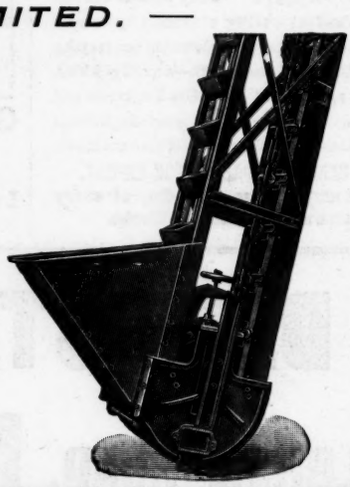

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